

M. Gargrave of
Geography school
THE

Use of the Globes,

CONTAINING

DEFINITIONS,

AND

PROPOSITIONS,

GEOGRAPHICAL,

AND

ASTRONOMICAL.

L E E D E S:

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THE
USE of the GLOBES, &c.

CHAP. I.

*Containing the Definitions and Uses of all the
Circles, &c. on the Terrestrial GLOBE.*

- (1) **A** GLOBE or SPHERE, is a round solid Body, having every Part of it's Surface equally distant from a Point within, call'd it's Centre.

We have great Reason to conclude, from several undoubted Observations and Experiments, that the whole Earth and Sea taken together is Globular, tho' not exactly Spherical, some of which are as follow :

1. ALL the other great Bodies visible in the Universe, viz. the Sun, Moon, Fixt Stars, and Planets, are Spherical; therefore, we cannot suppose the Figure of the Earth to be different from that of all the rest.

2. ALL the Appearances in the Heavens, both at Land and Sea, are the same as they wou'd be if the Earth was a Globe; which proves it to be of that Shape.

3. WHEN we are at Sea on board a Ship, we may

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be soon out of Sight of Land when the Land is near enough to be visible, if it were not hid from our Eye by the Convexity of Water.

4. SEVERAL Navigators have sail'd quite round the Globe. Thus Lord ANSON, lately setting out of the *English* Channel, continued sailing Westward, (allowing for the Windings of the Shore) till he return'd Home round the Cape of *Good-Hope*; which sufficiently evinces the Sphericity of the Waters.

5. BUT we have the plainest and most simple Proof of the Globular Figure of the Earth from that of its Shadow projected on the Moon in a Lunar Eclipse. For this Shadow is always found Circular, whatever Situation the Earth is in at that Time. Now a Body can be no other than a Globe which in all Situations casts a circular Shadow.

BUT from the latest Discoveries the true Figure of the Earth has been found to be an Oblate Spheroid, the Axis of which is some few Miles shorter than it's Equatorial Diameter arising from the Diurnal Revolution of the Earth about it's Axis; yet the Difference between this Body and a Mathematical Sphere is so very small, as to make no sensible Error in performing common Problems on the Globe.

IT is true the Surface of the Earth is far from being even and smooth, because it sinks into Valleys in some Places, and rises into Mountains in others; but these Inequalities upon its Surface are as inconsiderable, when compar'd with the Magnitude of the Earth, as the little

Asperities

Asperities upon the Rind of an Orange are to the bulk of the Orange.

AND accordingly we find that Mountains and Valleys upon the Earth's Surface cause no Irregularities in its Shadow in a Lunar Eclipse, but the Circumference thereof is even and regular as it were cast by a Body exactly round.

(2.) A TERRESTRIAL GLOBE, is the Image then of the Earth in little, which exhibits to our View the Surface of the Earth and the Parts thereof, as *Seas, Continents, Islands, Lakes, Rivers, Countries, Kingdoms, and States, &c.* in their proper Dimension, Shape, and Situation.

(3.) A MAP, is the Representation of the Earth, or Part thereof in Plano, or on a flat Surface.

A MAP differs from a Globe, not only as a flat or plain Surface or Superficies differs from a Spherical Body, but also in respect of the Object the Earth; wherefore we may say a Globe comes as near the Original as a Statue; a Map only as the Picture of a Man, the one shewing the Body in full Proportion, the other only the Lineaments thereof.

(4.) THE AXIS of the Earth in an imaginary right Line passing thro' its Centre, about which its daily Rotation is perform'd; and is represented on the Artificial Globe by the Spindle or Wire whereon it turns.

(5.) A GREAT CIRCLE is that which divides the
A 2 Globe

Globe into two equal Parts, having the same Centre as the Globe itself.

(6.) A LESS CIRCLE, divides the Globe into two unequal Parts, having a different Centre from that of the Globe.

Note, THE Great Circles are divided into 360 equal Parts, call'd *Degrees*, and each *Degree* is suppos'd to be divided into 60 equal Parts, called *Minutes*, &c.

(7.) THE PLANE of any Circle is that Surface on which it is drawn, or on which it is imagin'd to be drawn, and if that Surface be extended or imagin'd to be extended infinitely from the Centre of the said Circle, it is said to be in the Plane of that Circle.—And all Circles drawn or imagin'd to be drawn on that Surface are said to be in the same Plane; again, those Circles are said to be in different Planes when the Surfaces on which they are drawn cross one another, or are inclin'd to one another.

The chief Circles which serve to explain and describe the Surface of the Earth, as also the Properties of the Terrestrial Globe, are

The HORIZON.

The MERIDIAN.

The EQUATOR.

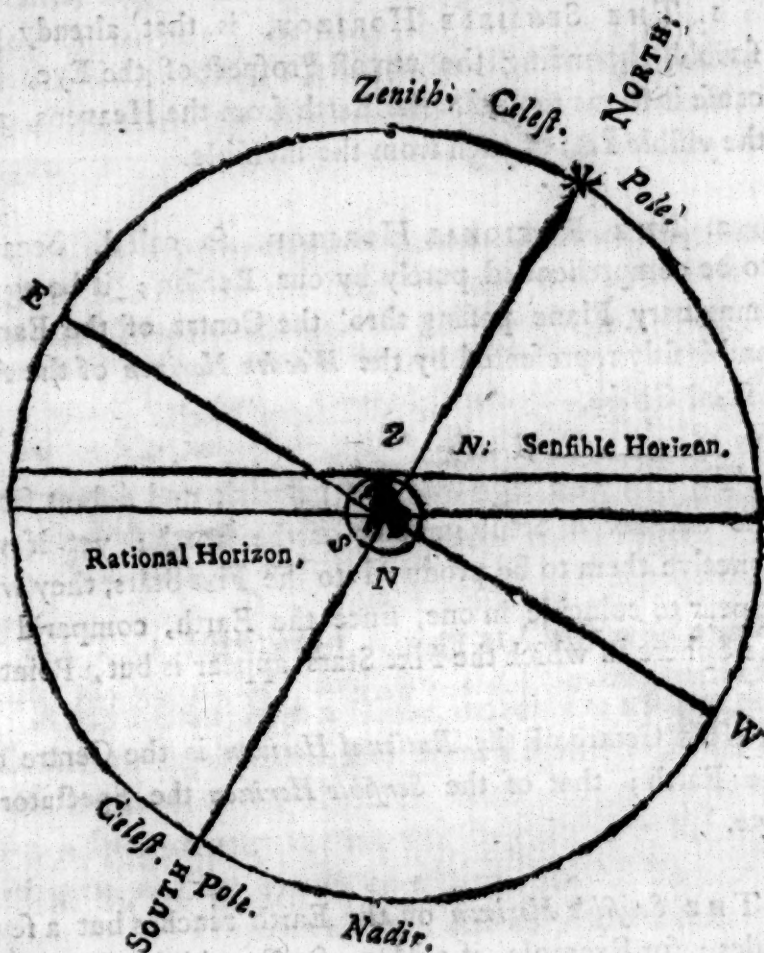
The ECLIPTIC.

The PARALLELS.

The Two TROPICS.

The Two POLAR CIRCLES, and these are call'd PARALLELS of DISTINCTION.

(8.) THE HORIZON, is that broad wooden Circle which divides the Globe into two equal Parts call'd the *Upper* and *Lower Hemispheres*.



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There are two Sorts of HORIZONS, viz. The Sensible, and the Rational.

1. THE SENSIBLE HORIZON, is that already describ'd, bounding the utmost Prospect of the Eye, because it seems to divide the Earth from the Heavens, and the visible Part of each from the invisible.

2. THE RATIONAL HORIZON, so call'd, because to be comprehended purely by our Reason; it being an imaginary Plane passing thro' the Centre of the Earth, and is fitly represented by the *Wooden Horizon* of the Artificial Globe.

THESE two *Horizons* are parallel, and distant from one another a Semidiameter of the Earth; yet if we conceive them to be produc'd to the Fixt Stars, they will appear to coincide in one, since the Earth, compar'd to the Sphere in which the Fixt Stars appear is but a Point.

THE Centre of the *Rational Horizon* is the Centre of the Earth; that of the *Sensible Horizon* the Spectator's Eye.

THE *Sensible Horizon* on the Earth reaches but a few Miles; for Example, if a Man, six Foot high, stood upon a large Plain, or on the Surface of the Sea, he cou'd not see the Sea itself, or the Land further than three Miles round.

USE. 1. THE *Horizon* determines the Time of the Rising and Setting of the *Sun, Moon, Stars, &c.*

2. It also determines the Length of the Artificial Day,

Day, which is the Time the Sun is apparently passing over the *Horizon* of any Place, and the Length of the Artificial Night, which is the Time that the Sun is hid below the *Horizon*; for when the Sun is in the *East* of the *Horizon* it's Rising; when in the *West* Part 'tis Setting; when it is above the *Horizon* 'tis Day; when below 'tis Night.

3. THE *Horizon* serves to find the Latitude, by shewing the Altitude of the Pole, or how much the Pole is elevated above the *Horizon*.

4. IT is also of great Use in Navigation to discover the Variation of the Needle, and Points of the Wind; the Division of the Compass being nothing else but the Division of the *Horizon* into 32 Parts, call'd *Points*.

(9.) THE MERIDIAN is a great Circle which passes thro' any given Place, and thro' the Poles of the Earth, and cuts the *Horizon* at right Angles, marks upon the Plane of it the North and South Points, and divides the Globe of the Earth into two Hemispheres call'd the *Eastern* and *Western*; and is represented on the Artificial Globe by the Brazen Meridian, wherein it hangs and turns.

EVERY Place upon the Earth has its Meridian, so that we may imagine as many Meridians as there are Points upon the Earth's Surface from *East* to *West*.

THE *Meridians* inscrib'd upon the Artificial Globe, are generally thirty-six Semi-circles terminating in both the Poles.

Note,

Note, THAT one of these *Meridians* is always reckon'd the First, and upon our *English* Globes is drawn thro' *London*.

THE *MERIDIAN* and *HORIZON*, are called *CHANGEABLE CIRCLES*, and the Globe is made moveable within these Circles to represent the Changeableness, whereby every Place on the Earth may be brought under it's proper *Meridian*, and be furrounded with its proper *Horizon*.

FOR whensoever we change Place upon the Earth, whether *East*, *West*, *North*, or *South*, we change our *Horizon*, both *Sensible* and *Rational*, since every Motion or Change of Place gives us a Hemisphere, or Sky, or Heaven, over our Head a little different from what it was; and we can see less on one Side of the Globe of the Earth, and more on the other Side.

AGAIN, Whenever we move towards the *East* or *West*, we change our *Meridian*; but we do not change our *Meridian*, if we move directly to the *North* or *South*.

USE. 1. THE *Meridian* regulates and exhibits the *Longitude*, or the Situation of Places from *East* to *West*, which is reckon'd on the *Equator*.

2. THE *Meridian* serves to determine the Altitude of the *Pole*, and the Distance of the *Equator*, or the *Latitude*; because the Arc of the *Meridian* compriz'd between the *Equator* and *Vertical Point* of the Globe, and intercepted between the *Pole* and the *Horizon* are equal.

3. IT points out Noon and Midnight to all those who are in it's Circle; begins the *Astronomical* Natural Day

at

at Noon, and the Civil at Midnight ; divides the Artificial Day into two Parts.

4. IT serves also to reckon the *Latitudes*, beginning at the *Equator* and advancing towards either *Pole*, *North* or *South*.

(10.) THE EQUATOR is that *Great Circle* on the Globe which divides it into two equal Parts, call'd the *Northern* and *Southern Hemispheres*. It is also call'd simply by way of Excellency the *LINE*, and that chiefly by Navigators, as being of singular Use in their Operations.

THE *Equator* which is divided into 360 Degrees, is the Origin and Standard of all Measures, and by being fixt itself, it fixes all the *Parallels* likewise.

USE. 1. THE Use of the *Equator* is to divide the Globe of the Earth into equal Parts or *Hemispheres*.

2. IT also marks the true *East* and *West* Points, call'd the *Equinoxes*, in all Countries round the Globe.

3. IT also serves to determine the Course and Measure of the *Parallels*; and is the Basis for finding and reckoning the *Latitudes*.

4. LONGITUDE is also reckon'd upon this Circle, which serves for many other Uses.

(11.) THE

(II.) THE ECLIPTIC, is that great Circle which passes thro' the *Equator* obliquely, one half declining towards the *North* and the other to the *South*, making an Angle with the *Equator* of $23\frac{1}{2}$ Degrees, and is that Circle in which the Sun seems to move round the Earth once in a Year.

THE *Ecliptic* is divided into twelve equal Parts, call'd *Signs*, and each *Sign* being 30 Degrees, beginning at one of the *Equinoctial Points*, call'd *Aries*; the Names and Characters of these *Signs*, are as follow, viz.

SPRING.			SUMMER.		
<i>Aries.</i>	<i>Taurus.</i>	<i>Gemini.</i>	<i>Cancer.</i>	<i>Leo.</i>	<i>Virgo.</i>
♈	♉	♊	♋	♌	♍
AUTUMN.			WINTER.		
<i>Libra.</i>	<i>Scorpio.</i>	<i>Sagittarius.</i>	<i>Capricorn.</i>	<i>Aquarius.</i>	<i>Pisces.</i>
♎	♏	♐	♑	♒	♓

THE first Six of these are call'd the NORTHERN SIGNS, and possess that Part of the *Ecliptic* which is to the *Northward* of the *Equator*, beginning with the first Point of ♈ and ended with the last Point of ♍

THE latter Six are call'd the SOUTHERN SIGNS, because they possess the *Southern* half of the *Ecliptic*, beginning at the first Point of ♎, and ending with the last Point of ♓.

NOTE, THE *Equator* and *Ecliptic* may be call'd

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UNCHANGABLE CIRCLES, because where ever we travel or change our Place on the Earth these Circles are still the same.

USE. 1. EACH Degree of the *Ecliptic* marks out nearly the Course of the Sun every Day, which never removes from this Line like the other Planets; I say nearly, because the Sun in 365 Days, 6 Hours, nearly runs thro' but 360 Degrees of the *Ecliptic*, that is, at the Rate of 58'. 08" daily. The 12 Parts into which this Line is divided shew the Signs and Months in the Year. The 30 Degrees in each Sign, the 30 Days which the Sun takes in passing thro' it. And the 360 Degrees give us the annual Course of the Sun, which is 365 Days, and 6 Hours nearly; these odd Hours every four Hours make a Day, and this Day is added to the last Year, which therefore consists of 366 Days, and is call'd *Leap Year*.

2. EVERY 12th Degree of the *Ecliptic*, marks the Course of the Moon every Day; so that she passes thro' the whole *Ecliptic* in about 30 Days, or somewhat less than a Month; and 12 of these Months make nearly the Solar Year; that is to say, the Moon passes thro' the *Ecliptic* 12 Times while the Sun is revolving it once.

3. THE *Ecliptic* exhibits the *Eclipses* of the Sun and Moon, because those Planets passing thro' that Line, but in different Manners, are with respect to us, sometimes in Conjunction, and sometimes in Opposition.

4. THE *Ecliptic*, being divided by the *Equator* into two equal Parts, that Part which advances towards the *North Pole* shews all the long Days of the *Northern Hemisphere*,

misphere, and the short Days of the *Southern*. The other Part on the contrary distinguishes the short Days of the *Northern*, and the long Days of the *Southern Hemisphere*.

5. THE *Ecliptic* being divided into four Parts, distinguishes the four Seasons of the Year apportioning three Signs to each; the *Northern Hemisphere* has for *Spring* ♈, ♉ and ♊; for *Summer* ♋, ♌ and ♍; for *Autumn* ♎, ♏ and ♐; for *Winter* ♑, ♒ and ♓. On the contrary, these three last Signs make *Summer* in the *Southern Hemisphere*; ♎, ♏ and ♐, make *Spring*; ♋, ♌ and ♍ make *Winter*; and ♈, ♉ and ♊ rule *Autumn*. So that when it is *Spring* in one *Hemisphere*, it is *Autumn* in the other; and when one has *Summer*, at the same Time the other has *Winter*.

(12.) PARALLELS, are so call'd as being parallel to the *Equator*, which is commonly accounted the first and chief of them.

THE *Parallels* are all lesser Circles and equi-distant, but not of equal Magnitude, being smaller nearer the *Poles*, and greater nearer the *Equator*.

THEY are distinguish'd into two Sorts, viz. 1. PARALLELS OF DISTINCTION, 2. PARALLELS OF LATITUDE, of which in their Order.

(13.) PARALLELS OF DISTINCTION, are four in Number, which from their Uses become more remarkable than the rest.

THE four *Parallels* belonging this Class, are the two *Tropics* and the two *Polar Circles*.

(14.) THE

(14.) THE TROPICS are the greatest of the four lesser Circles, they are describ'd at different Times by the Sun, are parallel to the *Equator* and $23\frac{1}{2}$ Degrees distant therefrom.

THAT which lies towards the *North* of the *Equator*, is call'd, *The Tropic of Cancer*, or the *Northern Tropic*, sometimes the *Summer Tropic*; and the other is also call'd, the *Tropic of Capricorn*, also the *Southern* or *Winter Tropic*.

USE. THE two Tropics bound the Sun's Course, and consequently shew the Sun's greatest Delination, or the Sun's greatest Distance from the *Equator*, which moving in a Spiral Line by turns comes to both, but never passes beyond them.

THEY also mark upon the *Ecliptic* the two Points of the Solstices, bound the Torrid Zone, and divide it from the Temperate ones.

(15.) THE POLAR CIRCLES are the two least of the four lesser Circles or Parallels of Distinction, running Parallel to the *Equator*, and are at the same Distance from the *Poles*, as the Tropics are from the *Equator*, viz. $23\frac{1}{2}$ Degrees.

THEY are described by the *Poles* of the *Ecliptic*; that which goes round the North Pole, is call'd, the Northern or Arctic Circle; the other, on Account of it's vicinity to the South Pole, is call'd, the Southern or Antarctic Circle.

USE. THESE Circles shew the Poles of the
B Ecliptic,

Ecliptic, inclose the Frigid Zones, and divide them from the Temperate.

(16.) THE PARALLELS OF LATITUDE, are so denominated because they distinguish the Degrees of Latitude, or Distance of Places from the Equator towards either Pole.

THE Parallels intersect the Meridians at Right Angles, and are reckon'd from the Equator towards either Pole, viz. 90 Degrees towards the North, supposing them to be drawn at every Degree of the Earth's Circumference, and as many towards the South, in all 180 Degrees.

USE. 1. THE Parallels exhibit and regulate the Latitude or Situation of Places from North to South which is reckon'd on the Meridian.

2. THEY serve to reckon the Longitudes beginning at the first Meridian, and proceeding by them from East to West, or from West to East, the Equator is of chief Use in this Respect, the Degrees of Longitude being number'd thereon.

There are twelve Points conceiv'd to be upon the GLOBE, viz. 2. Polar. 2. Vertical. 4. Cardinal. 2. Equinoctial, and 2. Solstitial; besides the Point within the Earth or Globe call'd the Centre.

(17.) THE POLES of the Earth are two fixt and immoveable Points, which terminate the Axis of the Earth;

Earth; the one is call'd the North, and the other the South Pole, and are known by the Poles of the Heavens under which they lie.

ONE of these Poles is call'd, like that in the Heavens, Arctic, from the Constellation of the Bear which is near it, and the other is call'd Antarctic, because it is directly opposite.

USE. THE Knowledge of the Poles is of great Use to the Geographer in determining the Distance and Situation of Places; for the Poles mark as it were the Ends of the Earth, which is divided in the Middle by the Equator; so that the nearer any one approaches the Poles, the further he removes from the Equator, and contrary-wise in removing from the Poles you approach the Equator.

(18.) THE two Points which are call'd VERTICAL, are the ZENITH and the NADIR, which signify the Points directly over ones Head, or Vertical as we express it, and Nadir which implies the opposite Point. Every Place of the Earth has these two Points, and we may be said to carry them about with us where ever we go.

USE. THESE two Points serve for Poles to the Horizon, and Point out the Parts whose Inhabitants are Antipodes to one another.

(19.) THE FOUR CARDINAL POINTS, or *Cardines Mundi* are so called by Analogy; because in them the World may be said to turn as a Door upon its Hinges;

they indicate the four principal Quarters of the World, and are nam'd *East, West, North* and *South*.

BESIDES these four Cardinal Points, there are several intermediate ones which may be conceiv'd to be as many as the Degrees or Minutes which the Horizon is divided into. But Mathematicians content themselves with 28, distinguished by the Names of the Winds which blow from them, and are call'd COLLATERAL POINTS.

USE. THE Use of the Cardinal and Collateral Points is to inform us how the Parts of the Earth are situated, or bear in respect of any particular Place, or of one another.

THEY afford a Foundation of the Division of the Earth by Lines of Position or Rhumbs, and for making the Compass, an Instrument of great Use in Geography and Navigation, for the Cardinal Points being known, the Collateral Points are known also.

(20.) THE EQUINOCTIAL POINTS are at the beginning of the Signs γ and ϖ , where the Ecliptic cuts the Equator ; when the Sun is in these two Points the Days and Nights are equal all over the World.— When the Sun enters γ , he is said to be the Vernal Equinox ; and in the Autumnal Equinox when he enters ϖ .

(21.) THE SOLSTITIAL POINTS are those at the Beginning of φ and ψ , where the Ecliptic just touches the two Tropics. These two Points shew the Sun's Place at the longest and shortest Days. These two
Days

Days are call'd the Summer and Winter Solstitices, because, as we observ'd before, the Sun seems to stand still, *i. e.* to make the Length of the Days neither increase nor decrease for twenty Days together.

USE. THESE four Points serve to divide the Ecliptic into the four Quarters of the Year; they likewise Point out the longest and shortest Days, as also when the Days and Nights are equal all over the Earth.

(22.) THE RHOMBS, are infinite spiral Lines all variously winding round the Globe at equal Angles from the Meridians, and from each other, till drawing near the Poles, they become confus'd and lose themselves.

OF all other Lines whatsoever, the Rhumbs are the most surprizing, having properly no Beginning or End; yet they have a Middle, are limited, and may be equally divided. They continually advance to the Polar Points, yet can never touch them; and any two of them of the same Direction may continually approach but never meet. The greatest Distance of any two of them is in the Equator, which consequently is their Mathematical Middle.—They may also be imagin'd to begin every where, except in the two Poles, being all of them of the same Kind and infinite in Number.

USE. THESE different Intersections of the Meridians and Parallels, form 32 Oblique Directions, commonly call'd POINTS OF THE COMPASS, whereof the North Point is generally distinguish'd by a *Flower-de-Luce*.

(23.) **LATITUDE** in Geography is the Recess or Distance of a Place from the Equator; or it is the Situation of a Place according to it's Parallel, whence Parallels are call'd Parallels of Latitude.

LATITUDE is reckon'd from the Equator towards either Pole, hence it is either Northern or Southern, according as the Place whose Latitude is spoken of is on this or that Side of the Equator.

No Place can have above 90 Degrees of Latitude because the Poles where they terminate are at that Distance from the Equator; the Places situated under the Equator have no Latitude, because Latitude is reckon'd from thence; only two Places are capable of greatest Latitude, because the Poles are but Points, whereas a great Number may have no Latitude, the Equator extending round the Globe.

(24.) **LONGITUDE** in Geography is the Distance of a Place from the first Meridian, or it is the Situation of a Place according to its Meridian.

LONGITUDE is reckon'd from the first Meridian towards the East or West; whence a Place is either in Eastern or Western Longitude.

No Place can have more than 180° of Longitude, because the Circumference of the Globe being 360 Degrees, no Place can be remov'd from another above half that Distance. Tho' some Geographers reckon the Longitude quite round the Globe.

PLACES situated under the first Meridian and the Poles, have no Longitude, because Longitude is reckon'd from the first Meridian, and all the Meridians terminate and are confounded in the Poles.

THE Degrees of Longitude are not equal, but diminish in Proportion as the Meridians incline or their Distance contracts in approaching the Poles. Hence in 60 Degrees of Latitude, a Degree or Minute of Longitude is but half the Quantity of a Degree or Minute on the Equator, and so of the rest as in the following Table.

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Shewing the N^o. of Miles contained in a Degree of Longitude in every Parallel of Latitude.

Lat	Miles	Sec.	Lat	Miles	Sec.	Lat	Miles	Sec.
0	60	: 00	—	—	—	—	—	—
1	59	: 56	31	51	: 24	61	29	: 04
2	59	: 54	32	50	: 52	62	28	: 08
3	59	: 52	33	50	: 20	63	27	: 12
4	59	: 50	34	49	: 44	64	26	: 16
5	59	: 46	35	49	: 08	65	25	: 20
6	59	: 40	36	48	: 32	66	24	: 24
7	59	: 37	37	47	: 56	67	23	: 28
8	59	: 24	38	47	: 16	68	22	: 32
9	59	: 10	39	46	: 36	69	21	: 32
10	59	: 00	40	46	: 00	70	20	: 32
11	58	: 52	41	45	: 16	71	19	: 32
12	58	: 40	42	44	: 36	72	18	: 32
13	58	: 28	43	43	: 52	73	17	: 32
14	58	: 12	44	43	: 08	74	16	: 32
15	58	: 00	45	42	: 24	75	15	: 32
16	57	: 40	46	41	: 40	76	14	: 32
17	57	: 20	47	41	: 00	77	13	: 32
18	57	: 04	48	40	: 08	78	12	: 32
19	56	: 44	49	39	: 20	79	11	: 28
20	56	: 24	50	38	: 32	80	10	: 24
21	56	: 00	51	37	: 44	81	9	: 20
22	55	: 36	52	37	: 00	82	8	: 20
23	55	: 12	53	36	: 08	83	7	: 20
24	54	: 48	54	35	: 26	84	6	: 12
25	54	: 24	55	34	: 24	85	5	: 12
26	54	: 00	56	33	: 32	86	4	: 12
27	53	: 28	57	32	: 40	87	3	: 12
28	53	: 00	58	31	: 48	88	2	: 4
29	52	: 28	59	31	: 00	89	1	: 4
30	51	: 56	60	30	: 00	90	0	: 0

Of the Division of the EARTH by ZONES and CLIMATES.

(25.) THE ZONES divide the Earth into five Portions bounded by Parallels of Distinction, being broad Spaces like Swathes girding the Earth about, and are Five in Number, *viz.* The Torrid Zone, the two Temperate, and the two Frigid Zones.

1. THE TORRID ZONE lies in the midst between the two Temperate, comprizing all the Space from one Tropic to the other ; it is divided by the Equator into two Parts, whence some divide this Zone into Northern and Southern.

2. THE TWO TEMPERATE ZONES are compriz'd between the two Tropics and Polar Circles ; they are call'd Temperate because being situated between the Torrid and Frigid Zones, they enjoy a temperate Air, especially in the Middle, where the Cold and Heat are more equally mix'd.

3. THE TWO FRIGID ZONES lie within the Polar Circles, being like Shields rather than Girdles ; they are call'd Frigid or Frozen, because most of the Year it is extreme Cold, and every Thing is frozen so long as the Sun is under the Horizon, or but a little above it.

(26.) A CLIMATE is commonly defin'd to be a Space of the Earth's Surface contain'd between two Parallels, wherein the Solstitial or longest Day of one exceeds that of the other by $\frac{1}{2}$ an Hour.

THE Climates may be call'd Lesser Zones, as agreeing

greeing with Zones in Form. There are generally accounted 60 Climates in Number, *viz.* 30 between the Equator and North Pole for one Hemisphere, and the same Number between the Equator and South Pole for the other Hemisphere.

THE 30 Climates of each Hemisphere are divided into Climates of $\frac{1}{2}$ Hours, or Artificial Days and Climates of Days continued. The Climates of $\frac{1}{2}$ Hours are reckon'd from the Equator to the Polar Circles to the Number of 24; because the Artificial Day always consists of 12 Hours at the Equator, and 24 Hours at the Polar Circles when the Sun is in the neighbouring Tropic; the Increase therefore is 12 Hours, which maketh 24 half Hours, and consequently so many Climates.

THE Climates of Days continued are reckon'd from the Polar Circles to the Poles, they are in Number 6, each containing an Interval of a Month; for the greatest Length of the Artificial Day at the Polar Circle being that of a Natural Day or 24 Hours, and 6 Months at the Poles, consequently there is in that Space an Increase of 6 Months.

USE. THE Use of the Climates is two-fold; the first and primary Use is to mark the various Lengths of Days at certain Intervals; the Second to determine thereby the Degrees of Latitude at such Intervals.

Of the several Positions of the GLOBE, commonly call'd SPHERES, Right, Parallel, and Oblique.

(26.) A RIGHT OR DIRECT POSITION of the Globe or Sphere is when the Poles of the Earth are
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in the Horizon, and the Equator passes thro' the Zenith of the Place, and the Parallels cut the Horizon at Right Angles, consequently are perpendicular to it; the Inhabitants of this Position or Sphere are those who live at the Equator.

(27.) A PARALLEL POSITION of the Sphere or Globe, is when the Poles of the Earth are in the Zenith and Nadir, and the Equator in the Horizon; the Inhabitants of this Position, if any, must be those who live at the Poles.

(28.) AN OBLIQUE POSITION of the Sphere or Globe, is when the Pole is elevated any Number of Degrees less than 90, for then the Equator and Parallels cut the Horizon obliquely; so that all the Inhabitants of the Earth except under the Equator and Poles have the Earth in this Position, which is more or less Oblique as the Pole is more or less elevated.

AND whereas there can be but one Right or Parallel Position, there may be as many Oblique, as there are different Degrees of Elevation.

The various Inhabitants of the Earth are likewise consider'd with respect to the several Meridians and Parallels peculiar to their Habitation, and that under these three Denominations, viz. ANTÆCI, PERIÆCI, and ANTIPODES.

(29.) THE ANTÆCI are those People of the Earth who live under the same Meridian but opposite Parallels;

Parallels; peculiar to these People are the following Particulars, viz.

1. THEY have the same Elevation of the Pole, but not the same Pole. 2. They are equally distant from the Equator but on different Sides. 3. They have Noon and Midnight at the same Time. 4. The Days of the one are equal to the Nights of the other, & *vice versa*. 5. The Seasons of the Year are contrary, it being Winter with one when Summer with the other.

(30.) THE PERIÆCI are those People who live under the same Parallel of Latitude but opposite Meridians; peculiar to these People are the following Particulars, viz.

1. THEY have the same Elevation of the Pole and the same Pole. 2. They are equally distant from the Equator and on the same Side. 3. When it is Noon with one it will be Midnight with the other, & *è contra*. 4. The Length of the Day to one is the Complement of the others Night. 5. They both agree in the Four Seasons of the Year.

(31.) ANTIPODES are those People of the Earth who live under opposite Parallels and opposite Meridians; peculiar to these People are the following Particulars, viz.

1. THEY have the same Elevation of the Pole but not the same Pole. 2. They are equally distant from the Equator but on different Sides, and different Hemispheres. 3. When it is Noon with one it is Midnight with

with the other, & *vice versa*. 4. The longest Day or Night to one is the shortest to the other. 5. The Seasons of the Year are contrary.

The Inhabitants of the Earth are likewise consider'd with respect to the Diversity of their Shadows, and accordingly are reduc'd to three Classes, viz. AMPHISCII, PERISCII, and HETEROSCII.

(32.) AMPHISCII are those People of the Earth who live in the Torrid Zone or between the two Tropics.

THEY are call'd Amphiscii, because their Noon Shadow is cast different Ways, according as the Sun is to the Northward or Southward of their Zenith; but when the Sun is in their Zenith they are call'd ASCIANS.

(33.) PERISCII are those People of the Earth who live in the Frigid Zone, or between the Polar Circles and the Poles.

THEY are so call'd, because their Noon Shadow is cast round about them towards all the Points of the Compass.

(34.) HETEROSCII are those People of the Earth who live in the Temperate Zones, or between the Tropics and Polar Circles.

THEY are so call'd, because their Noon Shadow is
C cast

cast only one Way, viz. North, if in the North Temperate; or South, if in the South Temperate Zones.

The Globe or Surface of the Earth may also be divided into its NATURAL and POLITICAL Parts; the one Distinction is made by the God of Nature, who created it, viz. into Land and Water; and the other by Men who inhabit it, and that into EMPIRES, KINGDOMS, STATES, &c.

The Land is distinguish'd into

CONTINENTS.	}}}	ISLANDS.
ISTHMUS's.		PROMONTORIES, OF
PENINSULAS.		COASTS.

(35.) A CONTINENT is a large Tract of Land, including many Kingdoms, and divers Countries not any where separated by the Sea, of such there are commonly reckon'd four, viz. *Europe, Asia, Africa, and America*. — Tho' in reality there are but two, viz. that of *Europe, Asia and Africa* making one; and *North and South America* the other.

(36.) AN ISTHMUS, is a narrow Neck of Land joining a Peninsula to the Continent; such is that of *Corinth*, betwixt the *Morea* and *Greece*; and of *Panama* betwixt the Kingdoms of *Peru* and *Mexico*.

(37.) A PENINSULA, is a Part of Land that is almost surrounded with Water, and which is join'd to the Continent by an Isthmus; such is the *Morea* above-mention'd:

mention'd : As is also *Africa* with regard to *Asia*, being join'd to the latter by that Neck of Land or Isthmus of *Suez*, which lies between *Egypt* and the *Red Sea*.

(38.) AN ISLAND is a Part of the Globe that is entirely compass'd about with Water ; of this Kind is *Madagascar*, *Sicily*, *Great-Britain*, and *Ireland*.

(39.) A PROMONTORY, is a Cape or Head of Land, which shoots itself into the Sea ; such is the Cape of *Good-Hope*, *Cape-Horn*, *The Lizard Point*, and *Land's End* in *England*, &c.

(40.) A COAST or SHORE is all that Land which borders upon the Sea, whether it be in Islands or Continents ; whence it comes to pass that sailing near the Shore is call'd Coasting.

The Water is divided into

OCEANS.	}	STRAITS.
SEAS.		CREEKS.
LAKES.		BAYS.
GULPHS.		RIVERS.

(41.) THE OCEAN is a vast spreading Collection of Water which is not divided or separated by Lands running between : Such is the *Atlantic* or *Western Ocean* between *Europe* and *America* ; the *Eastern* or *Indian Ocean* in the *East-Indies* ; the *Pacific Ocean* or *Great South Sea*, on the West-Side of *America*.

(42.) THE SEA, or more properly a SEA is only a Part of the Ocean interrupted by divers Islands, and near environ'd by Land ; such is the *Mediterranean*, the *Baltic*, the *Euxine*, the *Caspian*, and the *Red Sea*.

(43.) A LAKE, is a deep Collection of Water quite encompass'd with Land, and commonly retaining its own Water without the least Communication with the Sea ; such is that of *Geneva*, &c.

(44.) A GULPH is nearly the same Portion of the Sea as a Peninsula is of Land ; it is every where enclos'd, excepting one narrow Passage, whereby it communicates with the Main Ocean ; such are the Gulphs, of *Venice*, of the *Red Sea*, the Gulph of *Finland*, &c.

(45.) A STRAIT, call'd sometimes a Channel, is an open, tho' narrow Passage betwixt two Shores ; of this Kind are the Straits of *Gibraltar*, *Babelmandel*, *Magellan*, &c.

(46.) A CREEK, is a narrow Part or Arm of the Sea running a little way (a Furlong we will suppose) into the Land ; they are almost infinite upon every Coast.

(47.) A BAY is a much larger Inlet, and more safe and capacious for Ships to anchor in ; such as the Bay of *Biscay*, *Torbay*, *Bengal*, &c.

(48.) A RIVER is a Collection of Water perpetually.

petually issuing out of one or more Fountains and joining together till they fall into some considerable Lake or into the Sea ; the Principal of which are the *Nile*, that of the *Amazons*, *Senegal*, the *Danube*, *Volga*, *Rio-de-la-Plata*, &c.

By these and such like Bounds the Four Principal Quarters of the World before-mention'd are sub-divided into various Empires, Kingdoms, States, Common-Wealths, Principalities, Dukedoms, Provinces, Counties, Cities, Towns, Villages, &c. of different Manners, Politics, and Customs, thus for Example :

E U R O P E

IS situate between 10 Degrees West, and 65 Degrees East Longitude, and between 36 Degrees and 72 Degrees of North Latitude, bounded by the *Frozen Ocean* on the North, by *Asia* on the East, by the *Mediterranean Sea* (which divides it from *Africa*) on the South, and by the *Atlantic Ocean* on the West ; being 3000 Miles long, and 2500 broad. The grand Divisions of *Europe*, beginning on the West, are as follow :

Kingdoms and States.	Chief Towns.
SPAIN — — — — —	Madrid.
PORTUGAL — — — — —	Lisbon.
FRANCE — — — — —	Paris.
ITALY — — — — —	Rome.
SWITZERLAND — — — — —	Bern.
AUSTRIAN NETHERLANDS — — — — —	Brussels.
UNITED PROVINCES — — — — —	Amsterdam.
GERMANY — — — — —	Vienna.
POLAND — — — — —	Warsaw.
MUSCOVY, or RUSSIA — — — — —	Petersburgh.
SWEDEN — — — — —	Stockholm.
DENMARK — — — — —	Copenhagen.
NORWAY — — — — —	Bergen.
TURKEY in Europe — — — — —	Constantinople.

EUROPEAN ISLANDS, are

GREAT-BRITAIN, comprehending,

1. { ENGLAND — — — — — London.
SCOTLAND — — — — — Edinburgh,
2. IRELAND, and the adjacent Islands, } Dublin.
subject to Great-Britain. — — —
- ICELAND, subject to Denmark — } Skolbolt.
Hela.

The Islands of the *BALTIC*, are,

1. { ZELAND, -- } subject to Denmark.
FUNEN, &c. --
2. { ALAND, -- } subject to Sweden.
GOTHLAND, &c. --

2. DAGO,

3. { DAGO, --- } subject to *Russia*.
 OSEL, &c. -- }

In the *MEDITERRANEAN SEA*.

1. The Islands in the ARCHIPELAGO, sub. to *Turkey*.
2. SICILY, sub. to that King. — — *Palermo*.
3. SARDINIA, sub. to that King. — — *Cagliari*.
4. CORSICA, sub. to *Genoa*. — — *Bastia*.
5. MAJORCA, sub. to *Spain*. — — *Majorca*.
6. MINORCA, sub. to *Great-Britain*. -- *Citadella*.
7. IVICA, sub. to *Spain*. — *Ivica*.

A S I A

IS situate between 25 Degrees and 148 Degrees of Eastern Longitude, and between the Equator and 72 Degrees of North Latitude; being 4800 Miles long, 4300 Miles broad; bounded by the *Frozen Ocean* on the North, by the *Pacific Ocean* on the East, by the *Indian Ocean* on the South, and on the West by the *Red Sea*, the *Levant*, *Archipelago*, *Propontis*, the *Black Sea*, the River *Don*, and the Rivers *Volga* and *Oby* which fall into the *Frozen Ocean*.

The Grand Divisions of ASIA, beginning on the West, are as follow, viz.

Kingdoms and States.	Chief Towns.
1. TURKEY in ASIA, or ASIA MINOR.	Smyrna, Aleppo, Jerusalem, and Damascus.
2. ARABIA.	
	Mecca, Medina, Mocha.
	3. PERSIA,

- | | |
|---|--|
| 3. PERSIA. | <i>Ispahan, Mesched.</i> |
| 4. INDIA, within the
Ganges. | <i>Agra, Debly, Labor.</i> |
| 5. INDIA, beyond the
Ganges. | <i>Acham, Ava, Pegou, Siam,
Malacca, &c.</i> |
| 6. CHINA. | <i>Pekin, Nanking, Canton.</i> |
| 7. MOSCOVITE TARTARY, SIBERIA, and INDEPENDENT TARTARY. | |

The most remarkable of the Asiatic Islands, are

Japan, Formosa, Hainon or Anyan, The Philippines, Celebes, Gilolo, Molucco's, Borneo, Java, Sumatra, Ceylon, and the Maldivé Islands.

A F R I C A

IS a Peninsula joined to ASIA by the Isthmus of *Suez*, situate between 18 Degrees of West Longitude, and 50 Degrees East; and between 37 North, and 35 Degrees South Latitude; bounded by the *Mediterranean Sea*, which divides it from *Europe*, North; by the Isthmus of *Suez*, the *Red Sea*, and the *Indian Ocean* on the East; by the *Southern Ocean* on the South, and by the *Atlantic Ocean* on the West; being 4320 Miles long, and 4200 broad, and is divided into the following Kingdoms and States.

EGYPT,

				Chief Towns
N. E. Division containing	{	EGYPT,	— — —	Grand Cairo.
	{	NUBIA,	— — —	Nubia.
	{	ETHIOPIA.		
	{	ABYSSINIA.		

S. E. CAFFRARIA, or HOTTENTOT COUNTRY.

S. W. Division containing,	{	MATAMAN.		
	{	BENGUELA,	— — —	Benguela.
	{	ANGOLA,	— — —	Loanda.
	{	CONGO,	— — —	St. Salvador.
	{	LOANGO,	— — —	Loango.
	{	BENIN,	— — —	Benin.
	{	GUINEA,	— — —	Cape-Coast-Castle.
	{	NIGRITIA, or		
	{	NEGROLAND,	} — —	James Fort.

Western Division	{	ZAARA,	— — —	Sanhaga.
	{	BILEDULGERID,	— — —	Dara.
	{	MOROCCO,	— — —	Fez.

North Division, or Barbary Coast.	{	ALGIERS,	— — —	Algiers.
	{	TUNIS,	— — —	Tunis.
	{	TRIPOLI,	— — —	Tripoli.
	{	BARCA,	— — —	Docra.

The Middle of AFRICA from that call'd *Lower Ethiopia* is very little known.

The chief AFRICAN ISLANDS, are

Socotra, Madagascar, Comora Islands, St. Helena, St. Thomas, Ascension, Anabon, Princess Islands, Cape Verd Islands, the Canaries and Maderas.

AMERICA

A M E R I C A,

THE Western Continent, frequently denominated the *New World*, being but lately discover'd, is situate between 35 and 145 Degrees of Western Longitude, and between 80 North, and 58 South Latitude : Bounded by the Lands and Seas, about the *Arctic Pole*, on the North ; by the *Atlantic Ocean*, which separates it from the Eastern Continent, or *Old World*, on the East ; by the vast *Southern Ocean* on the South, and by the *Pacific Ocean*, which divides it from *Asia*, on the West ; being between Eight and Nine thousand Miles in Length, from North to South ; and its greatest Breadth scarce Three thousand Miles : It is divided into *North* and *South America*.

N O R T H A M E R I C A.

I. The Dominions of SPAIN, viz.

Chief Towns,

- | | | |
|--------------------------|----------|----------------------|
| 1. OLD MEXICO, | — — — | <i>Mexico.</i> |
| 2. NEW MEXICO, including | } ---- | <i>Santa Fee.</i> |
| CALIFORNIA. — | | |
| 3. FLORIDA, | — — -- — | <i>St. Augustin.</i> |

II. The Dominions of GREAT-BRITAIN, viz.

- | | | | |
|-----------------------------------|---|--------------------|-----------------------|
| North Di-
vision con-
tains | { | 1. NEW BRITAIN, — | <i>Rupert's Fort.</i> |
| | | 2. BRITISH CANADA, | <i>Port Nelson.</i> |
| | | 3. NOVA SCOTIA, — | <i>Annapolis.</i> |

4. NEW

Chief Towns.

<i>Middle Division contains</i>	{	4. NEW ENGLAND, —	<i>Boston.</i>
		5. NEW YORK, —	<i>York.</i>
		6. THE JERSEYS, --	<i>Burlington.</i>
		7. PENNSYLVANIA, —	<i>Philodelphia.</i>
		8. MARYLAND, ---	<i>Annapolis.</i>
<i>South Division contains</i>	{	9. NORTH CAROLINA,	<i>James Town.</i>
		10. VIRGINIA, —	<i>Williamsburgh.</i>
		11. SOUTH CAROLINA,	<i>Charles Town.</i>
		12. GEORGIA. — —	<i>Frederica.</i>

III. The Dominions of the FRENCH, are

1. CANADA Part, or NEW FRANCE.
2. FLORIDA Part, or LOUISIANA.
3. CAYEN, Part of CARIBBIANA.

SOUTH AMERICA, contains

1. TERRA FIRMA.
2. PERU.
3. CHILI.
4. TERRA MAGELLANICA.
5. LA PLATA, or PARAGUAY.
6. BRAZIL.
7. AMAZONIA.

The Principal Islands, are

- | | | |
|--------------|---|---------------|
| <i>North</i> | { | NEWFOUNDLAND. |
| | | CAPE BRETON. |

The

The ANTILLES.	{	Greater {	CUBA.
			JAMAICA.
			HISPANIOLA.
			PORTO RICO.
	{	Lesser {	CARIBBEES.
			LUCAYES.
			BERMUDAS.

<i>South.</i>	{	TERRA DEL FUEGO.
		FALKLAND Island.
		STATEN Island.

THESE are the chief Divisions of the Globe of the Earth ; but its Sub-divisions may be learnt from th Analytical Tables in Mr. RANDALL's System of Geography ; as also, a Description of the Empires and Kingdoms of the known World.





CHAP. II.

Contains Variety of Propositions in order to be explain'd by the GLOBES and MAPS.

SECTION I.

Of the Latitude of Places, and the Elevation of the POLE.

Prop. 1. **T**HE Latitude of any Place is always equal to the Elevation of the Pole in the same Place, & *é contra.*

Prop. 2. THE Elevation of the Equator in any Place is always equal to the Complement of Latitude in the same Place, & *vice versa.*

Prop. 3. ALL Places at the Equator, or under the Equinoctial Line have no Latitude ; it being there where the Calculation of Latitude begins.

Prop. 4. THOSE Places lying exactly under the Poles have the greatest Latitude ; it being there where the Calculation of Latitude ends.

Prop. 5. THOSE Places lying exactly under the first Meridian have nothing of Longitude ; it being there where the Calculation of Longitude begins.

Prop. 6. THOSE Places lying 180° . from the first Meridian have the greatest Longitude; it being there where the Longitude ends.

Prop. 7. ALL Places lying upon either Side of the Equator have the greater or lesser Latitude, according to their respective Distance therefrom.

Prop. 8. ALL Places lying upon either Side of the Equator, or exactly under the same, have the greater or lesser Longitude, according to their respective Distance from the first Meridian.

Prop. 9. THAT particular Place of the Earth lying exactly under the Interfection of the first Meridian and the Equator, hath neither Longitude nor Latitude.

Prop. 10. ANY Place being given upon the Globe or Map, to find its Latitude and Longitude.

		Lat.	Long.
Thus	{	ROME, —	41 : 54 n. 12 : 45 e.
		MADRID,	40 : 26 n. 3 : 05 w.
		CONSTANTINOPLE,	41 : 06 n. 28 : 58 e.
		MEXICO, —	20 : 00 n. 103 : 35 w.

Prop. 11. THE Latitude and Longitude of any Place being given, to find that Place on the Globe or Map.

		Lat.	Long.
Thus	{	PEKIN, — —	39 : 54 n. 116 : 25 e.
		BATAVIA, — --	6 : 30 s. 106 : 30 e.
		CAPE HORN, —	58 : 00 s. 80 : 00 w.

Prop. 12.

Prop. 12. To find the Difference of Latitude between any two given Places on the Globe or Map.

Thus the diff. of Latitude { *Rome and Madrid* — $1^{\circ} : 28'$.
between — — { *Pekin and Batavia* -- $46 : 24$.

Prop. 13. To find the Difference of Longitude between any two given Places on the Globe or Map.

Thus the diff. of Longitude { *Pekin and Batavia* — $9^{\circ} : 55'$.
between — — { *Rome and Madrid* -- $15 : 50$.

Prop. 14. To find the Latitude of any Place by the Sun or Stars.

Prop. 15. IF we are at Sea or Land, and find our Latitude, we may see on the Globe, Map or Chart that Parallel of Latitude in which we are.

Prop. 16. A PLACE being given on the Globe or Map to find all those Places that have the same Longitude or Latitude.

SECTION II.

Of the Division of the EARTH into ZONES, and the heavenly Appearances in those ZONES.

Prop. 1. IN all Places lying within the *Torrid Zone* the Sun is duly vertical twice a Year, to those under the *Tropics* once, but to them in the *Temperate* never.

Prop. 2. IN all Places of the two *Frigid Zones* the Sun appeareth every Year without setting for a certain

Number of Days, and disappareth for the same Space of Time. And nearer unto, or the farther from the Pole those Places are, the longer or shorter is his continued Prefence in, or Absence from the same.

Prop. 3. IN all Places lying exactly under the Arctic Circle as well as Antartic, the Sun at his greatest Declination appeareth every Year for one Day completely without setting, and entirely disappareth another; but daily riseth or setteth in those Places at all other Times of the Year.

Prop. 4. IN all Places situated in a Parallel Sphere, the Circle of the Sun's apparent diurnal Motion runs always parallel, or very near it, to the respective Horizon of such Places.

Prop. 5. IN all Places situated in a Right Sphere, the Circle of the Sun's apparent diurnal Motion is still perpendicular, or very near it, to the respective Horizon of such Places.

Prop. 6. IN all Places situated in an Oblique Sphere, the Circle of the Sun's apparent diurnal Motion is always Oblique unto, or cutteth the Horizon of such Places at unequal Angles.

Prop. 7. THE Day of the Month being given to find the Sun's Place in the Ecliptic, and Declination, and that upon the Globe or Map.

*To know the Day of the Month the Sun entereth any of the
Twelve Signs,*

MARCH, APRIL, JANUARY, the 20th Day,
The 21st of JUNE, DECEMBER, MAY;
Whilst JULY, AUGUST, SEPT. and OCTOBER
The 23d and 22 to NO'BER.

But FEBRUARY we only say,
The SUN's in *Pisces* the 19th Day.

*Prop. 8. To rectify the Globe for the Latitude, Ho-
rizon and Sun's Place.*

*Prop. 9. THE Day of the Month being given to find
those Places on the Globe or Map where the Sun when in
the Meridian will be vertical that Day.*

*Prop. 10. A PLACE being given in the Torrid Zone
to find those two Days in which the Sun when in the
Meridian will be vertical to the same.*

*THUS for Example, at the Island of St. HELENA, in
the ETHIOPIC OCEAN, the Sun when in the Meridian will
be vertical to it when he is in the 17th Degree of π , and
the 13th Degree of η ; that is, the 6th Day of FEBRUARY,
and the 5th Day of NOVEMBER.*

*Prop. 11. To find where the Sun is vertical at any
given Time assign'd; or the Day of the Month and Hour
of the Day being given at any Place to find in what Part
of the Globe the Sun is vertical at that very Time.*

*Prop. 12. THE Day of the Month being given to
D 3 find*

find those Places of the *North Frigid Zone* where the Sun then beginneth to shine constantly without setting; as also those Places of the *South Frigid Zone* in which he then beginneth to be totally absent.

THUS, on the 4th Day of MAY the Sun is 13 Degrees in δ , and his Declination will be found—16 Degrees, consequently all that Space of the FRIGID ZONE contain'd within the Parallel of 74 Degrees NORTH Latitude, the Sun there shines constantly without setting; whilst the opposite Parts of the Globe from 74 Degrees to the SOUTH POLE are hidden from the SOLAR RAYS.

Prop. 13. A PLACE being given in the *North Frigid Zone* to find what Number of Days the Sun doth constantly shine upon the said Place and what Days he is absent, as also the first and last Day of his Appearance.

THUS for Example, at KOLA in MOSCOVITE LAPLAND, being in Latitude $69\frac{1}{2}$ Degrees the Sun begins to shine there constantly without setting whilst he is moving in the Ecliptic from the 2d Degree of Π , to the 28th Degree of ϖ , or from the 23d Day of MAY, to the 19th Day of JULY, that is two Months, which is their longest Day; and in the Parallel of $69\frac{1}{2}$ Degrees SOUTH Latitude, on the 23d Day of MAY begins their Night of Two Months.

Prop. 14. ANY Place being given upon the Globe or Map, to find who are the *Antæci*, *Periæci*, and *Antipodes* to the Inhabitants.

Prop. 15.

Prop. 15. THE Inhabitants at the Equator have no *Antæci*, and their *Periæci* are the same as their *Antipodes*.

Prop. 16. THE Inhabitants, if any, at the *Poles* have no *Periæci*, and their *Antæci* and *Antipodes* are the same.

S E C T I O N III.

*Of the Length of Days in different Places of the Earth;
and the Division of the Earth into CLIMATES
which arise from thence.*

Prop. 1. THE Day and Night is of the same length twice a Year in all Places, save exactly under the *Poles*; where we may say 'tis neither Day nor Night for the Space of twenty-four Hours, when the Sun enters ♊ and ♋.

There are other Things peculiar to those two Places.

1. THE Sun only rises and sets there once a Year.
2. They have no Mid-day and Mid-night at a set Time; their Mid-day being at all Times for six Months, and the other Six 'tis always Mid-night.
3. THE Stars neither rise nor set, but some are always under the Horizon, and others are always above.
4. THE Sun and Stars keep almost the same Altitude all Day.
5. AT the *North Pole*, no Wine can be there call'd Northerly, they being all from the *South*, and at the other *Pole* the contrary.

Prop. 2.

Prop. 2. IN all Places at the Equator the Days and Nights are equal throughout the Year, for the Sun and all the Stars are twelve Hours above, and twelve Hours below the Horizon.

Prop. 3. IN all Places between the Equator and the two *Poles*, the Days and Nights are never equal to one another save only those two Times in the Year when the Sun enters ♈ and ♎.

Prop. 4. IN all Places lying under the same Parallel of Latitude, the Days and Nights are of the same Extent, and that at all Times of the Year.

Prop. 5. THREE or more Places being given on the Globe, that lie between the Equator and either of the *Poles*, and equi-distant from one another; the Extent of the longest Day in those Places doth not increase proportionably to the Distance of the Places themselves.

Prop. 6. THREE or more Places being given on the Globe, that lie between the Equator and the *Poles*, in which the Length of the longest Day doth equally increase; the Distance between the Parallels of those two Places is not equal to one another.

Prop. 7. THE Days increase continually in Northern Places while the Sun apparently moves from the first Degree of ♈ to the first of ♎; and the contrary happens in Southern Places.

Prop. 8. ALL Places upon the Face of the whole Earth, do equally enjoy the Light of the Sun, and are
equally

equally depriv'd of the Benefit thereof; the Days at one Time of the Year being exactly equal to the Nights of the opposite Season.

Prop. 9. The Latitude of any Place not exceeding $66\frac{1}{2}$ Deg. and the Day of the Month being given, to find the Time of the Sun's Rising and Setting, and the Length of the Day and Night.

Prop. 10. THE Latitude of any Place being given to find the Length of it's longest Day and Night.

Prop. 11. HAVING the Length of the Day in any Place, to find the Latitude of that Place.

Prop. 12. To find in what Latitude the longest Day is of any given Length less than 24 Hours.

Prop. 13. To find in what Latitude the longest Day is of any given Length less than 182 Days.

Prop. 14. To shew the Use of the Table of Climates.

1. HAVING the Latitude of any Place, to know it's longest Day and and it's Climate.

THUS, the Latitude of YORK is 54 Deg. YORK will therefore be found in the 10th Climate, and it's longest Day near 17 Hours.

2. HAVING the longest Day in any Place to find it's Latitude and Climate in that Place.

A TABLE.

A T A B L E

Of CLIMATES *between the EQUATOR and POLAR CIRCLES.*

Climates	Long. Day	Latitude	Breadth.
1	$12\frac{1}{2}$	8 : 25	8 : 25
2	13	16 : 25	8 : 00
3	$13\frac{1}{2}$	23 : 50	7 : 25
4	14	30 : 20	6 : 30
5	$14\frac{1}{2}$	36 : 28	6 : 08
6	15	41 : 22	4 : 52
7	$15\frac{1}{2}$	45 : 29	4 : 07
8	16	49 : 01	3 : 31
9	$16\frac{1}{2}$	51 : 58	2 : 57
10	17	54 : 27	2 : 29
11	$17\frac{1}{2}$	56 : 37	2 : 10
12	18	58 : 29	1 : 52
13	$18\frac{1}{2}$	59 : 58	1 : 29
14	19	61 : 18	1 : 20
15	$19\frac{1}{2}$	62 : 25	1 : 07
16	20	63 : 22	0 : 57
17	$20\frac{1}{2}$	64 : 06	0 : 44
18	21	64 : 49	0 : 40
19	$21\frac{1}{2}$	65 : 29	0 : 32
20	22	65 : 47	0 : 26
21	$22\frac{1}{2}$	66 : 06	0 : 19
22	23	66 : 20	0 : 14
23	$23\frac{1}{2}$	66 : 28	0 : 08
24	24	66 : 31	0 : 03

CLIMATES *between the POLAR CIRCLES and the POLES.*

Climates	Long. Day	Latitude	Breadth.
25	1 <i>Mon.</i>	67 : 15	0 : 59
26	2	69 : 30	2 : 00
27	3	73 : 20	3 : 50
28	4	78 : 20	5 : 00
29	5	84 : 10	5 : 40
30	6	90 : 00	6 : 00

THUS, if the longest Day at *PETERSBURG* is $18\frac{1}{2}$ Hours it will be found in Latitude $59:58$, and in the *13th* Climate.

3. *HAVING* the Climate to find the longest Day and the Latitude.

THUS, *KOLA* in *Moscovite Lapland* is in the *26th* Climate, consequently its longest Day is two Months and its Latitude will be found— $69\frac{1}{2}$ Deg.

SECTION IV.

Of the the different Rising and Setting of the Sun, the Length of Days with his Altitude and other Appearances, also Twilight and the Difference of Time in different Parts of the Earth.

Prop. 1. If the Difference of Longitude of two Places be exactly 15° Degrees, the People residing in the $\left\{ \begin{array}{l} \text{Eastward} \\ \text{Westward} \end{array} \right\}$ of them will reckon the Time of the Day $\left\{ \begin{array}{l} \text{Sooner} \\ \text{Later} \end{array} \right\}$ by one Hour, than those in the other: If the Difference be 30 Degrees, then they will reckon their Hours $\left\{ \begin{array}{l} \text{Sooner} \\ \text{Later} \end{array} \right\}$ by two Hours; if 45 Degrees by three Hours; and if 60 Degrees, by four Hours, &c.

Prop. 2. If People in two distinct Places do differ exactly one Hour in reckoning their Time, it being Noon with one, when one in the Afternoon with the other; the true Distance between the respective Meridians of those Places is exactly 15 Degrees upon the Equator.

If

If they differ two Hours, the Distance is 30 Degrees. If three it is 45 Degrees. And if four, 'tis completely 60 Degrees.

Prop. 3. If a Ship set out from any Port and steering Eastward, doth entirely furround the Globe of the Earth, the People of the said Ship in reckoning their Time will gain one Day completely at the Return, or count one Day more than those residing at the said Port, if Westward, then they will lose one, or reckon one less.

Prop. 4. If two Ships set out from the same Port at the same Time, and both surround the Globe of the Earth, one steering East and the other Westward, they'll differ from one another in reckoning their Time two Days completely at their Return, even suppose they happen to arrive on the same Day: If they surround the Earth twice, steering as aforesaid they'll differ four Days, if thrice then Six, &c.

Prop. 5. If several Ships set out from the said Port, either at the same, or different Times, and do all surround the Globe of the Earth some steering due *South*, and others due *North*, and arrive again at the same Port; the respective People of those different Ships at their Return will not differ from one another in reckoning their Time, nor from those who reside at the said Port.

Prop. 6. IN all Places of the *TORRID ZONE*, the Morning and Evening, Twilight is the least, in the *Frigid* greatest, and in the *Temperate* 'tis a Medium betwixt the two.

Prop. 7. THE Hour of the Day being given in any Place

Place, to find what Hour it is in any other Part of the World, and that upon the Globe or Map.

Prop. 8. THE Day and Hour being given to find those Places on the Globe where the Sun hath a given Altitude less than 90 Degrees.

Prop. 9. THE Latitude of any Place being given, and the Sun's Place in the Ecliptic, to find thereby the Beginning of the Morning, and End of the Evening Twilight.

Prop. 10. THE Day and Hour of the Day at any Place being given, to find all those Places upon the Earth where the Sun is then rising, setting, culminating, or on the Meridian; also where it is Day-light, Dark-night, Midnight; where the Twi-light then begins, and where it ends; the Height of the Sun in any Part of the illuminated Hemisphere also his Depression in the obscure Hemisphere.

SECTION V.

Of the mutual Situation of Places and their Distances.

Prop. 1. No Place of the Earth is distant from another above 10,800 Italian Miles allowing 60 to a Degree.

Prop. 2. No Place of the Earth is distant from its proper Antipodes diametrically taken above 6873 Miles, still allowing 60 to a Degree at the Equator.

Prop. 3. ANY Place being given upon the Globe, to find the true Situation thereof from all other Places desired.

G

Prop.

Prop. 4. ANY Place being given upon the Globe, to find all other Places that are situated from the same upon any desired Point of the Compass, which is also called the Angle of Position.

AND here Note, that the Angle of Position between two Places is quite different from what is meant by the Bearings of Places; the Bearing is call'd the Rhumb Line as defin'd in Article 22d foregoing, and is a Line passing between two Places in such a Manner as to make the same or equal Angles with all the Meridians through which it passeth. But the Angle of Position is the same Thing as what is call'd the Azimuth in Astronomy, both being form'd by the Meridian and a great Circle passing through the Zenith of a given Place, and a given Point either in the Heavens then called the Azimuth or upon the Earth then called the Angle of Position.

THUS, the Angle of Position from the *Lizard* to the *Island of Barbadoes* will be found nearly 71 Degrees South Westerly.

NOTE, THE Angle is not the same back again, as the opposite Points of the Rhumbs are, but variously different, as will appear by this Example; for the North Position varies from the South near 34 Degrees, so that the Angle of Position from *Barbadoes* back to the *Lizard* will be only 37 Degrees North East.

Prop. 5. To find the Bearing of one Place from another.

IF both the given Places lie in one Parallel their Bearing

is either *East* or *West* from each other ; if under the same Meridian, they are *North* and *South* from each other ; but if a Rhumb Line pass through both of them, then their Bearing is shewn thereby.

IF a Rhumb Line does not pass through either of them, see to which the given Places are nearest Parallel, and accordingly that will bear the Bearing sought.

THUS the Bearing of the *Hesperides* from the *Island of Bermudas* will be found nearly *West North-West*.

Prop. 6. To find the Distance of two Places on the *Globe* or on the *Maps* made for particular Places.

Prop. 7. To find the Distance of two Places on *Circular Maps*.

This Proposition admits of six Cases,

1. IF two Places lie on the Equator the Degrees contained between them being multiplied by 60, will give their mutual Distance in *Italian Miles*, and being multiplied by 70 gives their Distance in *English Miles* nearly.

2. IF the two Places lie upon the same Meridian, but in different Latitudes ; that is, one *North* and the other *South Latitude* ; add their Latitudes together, and their Sum being multiplied by 60 gives their Distance in *Italian Miles*.

3. IF the two Places lie upon the same Meridian and both in *North* or *South Latitude* ; their Difference of Latitude being multiplied by 60 will give their mutual Distance in *Italian Miles*.

G 2

4. IF

4. IF the Places have both *North* or *South Latitude*, but 180 Degrees difference of Longitude, the Sum of the Compliments of their Latitude gives the *Miles* they are distant mutually being multiplied by 60.

5. IF one Place lie in *North*, and the other in *South Latitude*, and 180 Degrees be their Difference of Longitude; then the Difference of their Latitudes taken from 180 Degrees, and the Remainder multiplied as before, will give their Distance from each other in *Miles*.

6. But if the Places be in none of these Positions, and differ both in Longitude and Latitude, the Distance between them (having their Latitude and difference of Longitude known) may be found with working by a *Scale of vers'd Sines*.

BUT if the Projection doth not exceed a particular Kingdom; a Pair of *Compasses* extended from one Place to the other and applied to the *Scale* on either Side the *Map* will give the Distance exact enough without any more Trouble.

SECTION VI.

Of the Earth's annual and diurnal Motion where we shall mention the Seasons.

Prop. 1. THE Sun is the Centre of our System, and the Earth turns round the Sun.

Prop. 2. THE Earth has also another Motion round its Axis from *West* to *East* in 24 Hours,

Prop.

Prop. 3. THIS Rotation of the Earth round it's Axis produces an apparent Revolution of the Heavens round the Earth.

Prop. 4. To explain *Day-Light, Darknight*, with the Circle bounding *Light* and *Darkness*.

Prop. 5. THE AXIS of the Earth is not perpendicular to the Plain of the Ecliptic.

Prop. 6. THE Day of the Month being given to shew at one View the Length of the Day and Night in all Places upon the Earth, at that Time; and to explain more fully how the Vicissitudes of Day and Night are really made by the Motion of the Earth round it's Axis in 24 Hours.

Prop. 7. To explain in general upon the artificial Globe, the Alteration of Seasons, or Length of Days and Nights made in all Places of the Earth by the Earth's annual Motion in the Ecliptic.

Prop. 8. To shew by the Globe at one View the Length of the Days and Nights in any particular Place at all Times of the Year.

NOTE, The Velocity of the mean Motion of the Earth in it's annual Orbit is computed to be at the Rate of $15\frac{1}{2}$ Miles nearly in a Second of Time, 933 in a Minute, 56000 in an Hour; which is 100 Times swifter than the Motion of a Cannon Ball. Any Point of the Earth's Equator moves by the *diurnal Rotation* at the Rate of about 17 Miles in a Minute, and 1020 in an Hour.

SECTION VII.

Containing a Collection of Geographical Paradoxes to be resolv'd by the Terrestrial Globe.

Par. 1. THERE are two remarkable Places on the Globe of the Earth in which there is only one Day and one Night throughout the whole Year.

Par. 2. THERE are some Places upon the Earth, in which the natural and artificial Day are the same, *viz.* 24 Hours at a certain Time of the Year.

Par. 3. THERE is a certain Place of the Earth, at which if two Men should chance to meet one would stand upright upon the Soles of the others Feet, and neither of them would feel the others Weight, and yet they both should retain their natural Posture.

Par. 4. THERE is a certain Parallel of Latitude upon which a Ship may sail round the Globe, and may all that Time observe the Body of the Sun above the Horizon.

Par. 5. THERE is a certain Place of the Terraqueous Globe, to which the Sun and Moon rise always in the *North*, and set in the *North*.

Par. 7. THERE are two Places of the Earth which bear directly *North* and *South* of each other, and their Distance is 100 Miles ; but the true Course from one of those Places to the other, is to sail 50 Miles due *North*, and 50 Miles due *South*.

Par.

Par. 7. THERE are two Parallels of Latitude in one of which less *Gold* will make a pound Weight, than in the other.

Par. 8. THERE is a certain Place on the Globe of a considerable *Southern* Latitude that hath both the greatest and least Degree of Longitude.

Par. 9. THERE are three remarkable Places on the Globe that differ both in Longitude and Latitude, and yet all lie under one and the same Meridian.

Par. 10. THERE are three remarkable Places on the Continent of *Europe*, that lie under three different Meridians, and yet all agree both in Longitude and Latitude.

Par. 11. THERE is a particular Place of the Earth where the Winds tho' veering round the Compass, do always blow from the *North Point*.

Par. 12. THERE is a certain *Island* in the *Baltic Sea*, to whose Inhabitants the Body of the Sun is clearly visible in the Morning before he riseth, and likewise in the Evening after he is set.

Par. 13. THERE is a certain Village in the Kingdom of *Naples* situated in a very low Valley, and yet the Sun is nearer to the Inhabitants thereof every Noon by 3000 Miles and upwards, than when he riseth or setteth to those of the said Village.

Par. 14. THERE is a vast Country in *Etheopia* superior to whose Inhabitants the Body of the Moon doth always appear

appear to be most enlighten'd when she's least enlighten'd, and to be least when most.

Par. 15. THERE is a certain Place of the Earth of a considerable *Northern Latitude*, where tho' the Days and Nights do consist of several Hours, yet in that Place it is Mid-day or Noon every quarter of an Hour.

Par. 16. THERE are two Places on the *Terraqueous Globe*, one bearing due *North* from the other at least 112 *Miles Italian*, yet in travelling between them you do not raise the Pole one Degree.

Par. 17. THERE is a certain noted Place of the Earth, where the Sun and Moon (*ipso tempore plenilunii*) may both happen to rise at the same Time, and upon the same Point of the Compass.

Par. 18. THERE are divers Places on the Globe of the Earth, where the Sun and Moon, yea and all the Planets, do actually rise and set according to their various Motions, but never any of the fixt Stars.

Par. 19. THERE is a certain European City whose Buildings being generally of firm Stone, are for the most Part of a prodigious Height, and exceeding Strong, and yet it is most certain that the Walls of that Building are not parallel to one another nor perpendicular to the Plain on which they are built.

Par. 20. THERE is a certain *Island* in the *Baltic Sea*, upon which if two *Children* were born at the same Instant of Time and living together for several Years should both expire on the same Day, yet the Life of the one would surpass the Life of the other by several Months. *Pa. 21.*

Par. 21. THERE are two Places lying in the 'Torrid Zone that are not above 60 Miles distant from one another, but if a Ship sail from one to the other, on one particular Point of the Compass, the Difference of Time between those two Places will actually be found to be above 23 Hours.

Par. 22. THERE are divers remarkable Places on the Globe whose *Sensible Horizon* is commonly fair and serene; and yet 'tis impossible to distinguish in it properly any one of the intermediate Points of the Compass, nay not so much as two of the four Cardinal Points themselves.

Par. 23. THERE are 24 Places on the *Teraqueous Globe*, in which all the 24 Hours of the natural Day do always exist at the same Time; and yet the Distance of any two of those Places does not exceed 60 Miles.

Par. 24. THERE is a certain *Mountain* call'd *Pike St. George* in the *Azor Islands* of a prodigious Height, and is known to have this surprizing Property; that a Vessel will hold more Water at the Bottom of this *Mountain*, than when carried to it's Top or Vertex.

Par. 25. THERE are three distinct Places on the Continent of *Europe*, lying under the same Meridian, and at such a Distance, that the Latitude of the Third surpasseth that of the Second by so many Degrees and Minutes exactly as the Second surpasseth the First; and yet the true Distance of the First and Third from the Second (or intermediate Place) is not the same by a great many Miles.

Par. 26. THERE is a certain *Island* in the vast *Atlantic Ocean*, which being descry'd by a Ship at *Sea*, and bearing
due

due *East* of the said Ship at 12 Leagues Distance by Estimation ; the truest Course for hitting of the said *Island* is to steer six Leagues due *East*, and as many due *West*.

Par. 27. THERE is a large and spacious Plain in a certain Country in *Asia* able to contain 600,000 Men drawn up in Battle Array ; which Number of Men being actually brought thither, and there drawn up, it were absolutely impossible for any more than one single Person to stand upright upon the same Plain.

Par. 28. THERE are several Places of a considerable Distance from one another, that lie all directly *East* from *London*, but *London* does not lie directly *West* from any of the said Places.

Par. 29. 'TIS certainly Matter of Fact, that three certain Travellers went a Journey, in which though their Heads travell'd full 12 Yards more than their Feet, yet they all return'd alive, with their Heads on.

Par. 30. THERE are certain Places in *North Latitude*, whose longest artificial Day, is considerably longer by some Hours than the longest artificial Day with those in the same Degree of *South Latitude*.

Par. 31. THERE are three remarkable Places on the *Terraqueous Globe* to whose Inhabitants all the Stars are visible on three certain Nights of the Year.

Par. 32. THE *Christians* observe the first Day of the Week for their Sabbath, the *Jews* the seventh, and the *Turks* the sixth Day of the Week for their Time of Wor-
ship

ship. Now there is a certain Place on the *Terraqueous Globe*, where if a *Christian*, a *Jew*, and a *Turk* should meet, each would observe his own true Sabbath on the self same Day.

Par. 33. THERE are two Places on the Surface of the Globe, that bear directly *North* from each other.

Par. 34. THERE are likewise two Places on the Globe, the First of which bears directly *North* from the Second, notwithstanding the Second bears directly *West* from the First.





C H A P III.

A brief Account of the Solar System.

BEFORE we proceed to shew the several USES of the CELESTIAL GLOBE, it may be proper to premise something of the UNIVERSE in general, and of the SOLAR SYSTEM in particular of which they are respectively suppos'd to represent a Part.

NOW by the UNIVERSE we are to understand the general Frame of Nature, even to the utmost Bounds and Extent of the Creation; it being founded upon this Hypothesis, that the Stars are so many Suns; that each of these Stars or Suns is attended (as ours is,) by a proper Number of *Planets* and *Comets*; and that each hath a gravitating Power independant of each other.

As, therefore, these several Systems cannot interfere with one another, the Universe or the whole Space that invelopes them all must be vastly immense, too boundless and extensive for human Reason to comprehend. For if that small Part of it, which we are acquainted with, takes up the Space of at least 22,400,000,000 Miles in Diameter, how immensely great, or infinite rather, must be the Whole.

BUT, to speak of that Part of the Universe which we
call

call the visible World, or Solar System, made more intelligible and adequate to our Faculties by *Teliscopic* and other Observations. We shall take it for granted that the Sun is the Centre of it ; and that our *Earth*, together with *Saturn*, *Jupiter*, *Mars*, *Venus* and *Mercury*, are the Planets, or wandering Stars which move round it. These to us appear like Stars of the first Magnitude, and the Earth or Planet we live upon, must in like manner appear to them.

AND then again, as these Planets which we call Primary ones, perform their Revolutions round the Sun ; so there are others of a secondary Nature, that attend likewise some of them ; thus the Earth has one secondary Planet, or Satellit, *viz.* the *Moon*, performing its Revolution in a stated Period about it ; *Saturn* has *Five*, and *Jupiter* *Four*, performing the like Offices.

FIRST then the SUN, the Centre of this System which dispences Light and Heat to the Whole, is observ'd to revolve round its AXIS from *West* to *East* in about $25\frac{1}{4}$ Days ; its Diameter is found to be 763,000 Miles.

NEXT to the Sun is *Mercury*, which is not yet known to move round its AXIS ; it is 27 times less than the Earth ; makes one Revolution round the Sun in 87 Days, 23 Hours, 16 Minutes, from which its mean Distance is computed to be 32,000,000 Miles.

VENUS the brightest of the primary Planets is three times less than the Earth, moves round its own AXIS in 23 Hours, being 59,000,000 Miles at a mean Distance

F from

from the Sun ; about which it performs its Revolution in 224 Days, 16 Hours, 49½ Minutes.

THESE two Planets are called *Inferior Ones*, in as much as they are circumscrib'd within the Earth's Orbit ; neither is the greatest Elongation or Distance of the former from the Sun, ever found to be more than 28° or, of the Latter more than 48° . This proves that each of them has a Motion round the Sun, and at the same time shews the Reason why *Mercury* is so seldom visible ; and that *Venus* becomes our Morning or Evening Star, as her Aspect is *Eastward* or *Westward* of the Sun.

THE next Planet to *Venus* is the *Earth* we live upon, which is carried about the Sun in 365 Days, 5 Hours, and 48 Minutes. This Revolution is commonly called a Year, and by Astronomers a *Tropical Year*, to distinguish it from the *Syderial Year*, which depending on the Precession of the Equinoxes, is sometimes longer, but of this we shall speak hereafter.

BESIDES the Annual, the Earth has also a Diurnal Motion upon it's own AXIS, as was before observ'd in the Space of nearly 24 Hours, and thereby affords us the Interchange of Day and Night, this Motion is from *West* to *East* ; by Virtue of which, we that are carried along the Surface, observe every Object plac'd above us (such as *Sun*, *Moon* and *Stars*,) to move the contrary Way. Now that Space of Time which the Sun seems to take up in passing from any fix'd Meridian to its Return to the same, is call'd a *Natural Day* consisting exactly of 24 Hours.

WE are to observe farther of the Earth, that the Diameter of it is 7,969 Miles, the Circumference 250,358 ; whereby the Quantity of a Degree in the Arc of a great Circle will be about 70 Miles ; the mean Distance of it from the Sun is 81,000,000 Miles ; and the Bigness of it, with Regard to the same Luminary is only one 200,000 Part. The highest Verge of the Atmosphere or Region of Clouds and Vapours is about 44 Miles.

THE EARTH has a secondary Planet or Satellit moving round it which is the *Moon* ; being $\frac{1}{80}$ Part as big as the Earth, and is at the Distance of about 240,000 Miles from it. This is the most irregular of the Planets, occasioned, First, by her proper Motion about the Earth round her own Orbit ; and then, Secondarily, as she is carried along with the Earth round the Sun. However she is observ'd to go once round her own Axis in 27 Days, 7 Hours, and 43 Minutes, and in the like Space to perform one Revolution round the Earth ; which is the Reason that she always presents the same Side or Hemisphere to us. She finishes her monthly Revolution in about $29\frac{1}{2}$ Days, after having continually chang'd her Phases or Aspects with regard to the Sun.

MARS the next Planet in our System, is with regard to our *Earth*, call'd a *superior Planet*, because the Earth is circumscrib'd within its Orbit. It is however about 15 times less than our Earth, though 42,000,000 Miles farther distant from the Sun ; round which he revolves in 1 Year, 321 Days, 23 Hours, and 27 Minutes. The Motion round its own Axis is perform'd in 24 Hours and 40 Minutes.

JUPITER, the next Planet in order makes one Revolution round the Sun in 11 Years, 317 Days, 12 Hours, 20 Minutes, and 24 Seconds, from which it is distant 424,000,000 Miles; It is 6054 times bigger than the Earth, and turns round upon its Axis once in 9 Hours, and 57 Minutes.

SATURN the remotest Planet in this System is distant from the Sun 777,000,000 Miles, and performs its Period in 29 Year, 174 Days, 6 Hours and 36 Minutes; it is 298 times bigger than the Earth, and revolves about its Axis once in 29 Days, 10 Hours and 1 Minute.

THIS Planet has a flat Ring or Zone that surrounds it, which to the Eye, looks sometimes like the Horizon plac'd round an artificial Globe; though at other times it has an Oval or different Aspect. It is distant from Saturn, near $\frac{1}{3}$ of Saturn's Diameter, being likewise nearly of the same Brightness.

BOTH JUPITER and SATURN have their Satellites or secondary Planets, but as they are not visible to the naked Eye, we shall take no further Notice of them.

THE proportional Magnitudes of the foregoing Planets are according to *Street's Tables*; tho' Dr. Keil lays down their respective Diameters in the following Manner, viz.

The Diameter of the Sun, is to the Diameter of	{ SATURN JUPITER MARS The EARTH VENUS MERCURY }	as 1000 is to	{ 137 181 6 12 12 4 Mr.

Mr. WHISTON lays them down in the following Manner, *viz.*

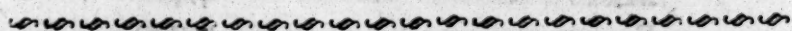
			Miles.
SATURN	—	—	61,000
JUPITER	—	—	81,000
MARS	—	—	4,400
EARTH	—	—	7,970
VENUS	—	—	7,900
MERCURY	—	—	4,248
The MOON	—	—	2,170

Now all these Planets, whether primary or secondary Ones, borrow all their Light from the Sun; and therefore do not appear so bright and twinkling as the Stars, whether they are view'd with the naked Eye or by Telescopes. And there is likewise this further Difference betwixt them and the Stars: That the Stars are call'd *fix'd*, or never altering their Places in the Heavens, whereas the other are call'd Erratic or Wandering, inasmuch as they are continually shifting; in the same Manner the Sun is observ'd to do, from one Side of the Equator to the other, according to the respective Periods of their Revolutions. And these are the Phænomena which we shall endeavour to account for, and solve by the *Celestial Globe*, after we have laid down the following Definitions.



C H A P. IV.

Containing the Definitions and Uses of the Circles, &c. on the Celestial Globe.



(I.) **T**HE CELESTIAL GLOBE is an artificial Sphere on whose Convex Surface the fixt Stars are laid down at proportionable Distances; and those again are rang'd within divers Images or Figures invented by the Antient, and continued by the modern Astronomers, and call'd by them both, Astrisms or Constellations.

THESE Constellations are divided into *Northern* and *Southern*, besides the twelve *Zodiacal Constellations* or Signs before mentioned, which lie in the Middle between both. The Names and Number of Stars belonging to each Constellation, according to the *Britannic Catalogue* are as follow, *viz.*

Names.	Nº. of Stars.	
1 ARIES.	65	} Constellations in the Zodiac.
2 TAURUS.	135	
3 GEMINI.	89	
4 CANCER.	72	
5 LEO.	94	
6 VIRGO.	89	
7 LIBRA.	47	
8 SCORPIO.	49	
9 SAGITTARIUS.	50	
10 CAPRICORN.	51	
11 AQUARIUS.	99	
12 PISCES.	109	
		13 ANDRO.

			Nº.	
13	ANDROMEDA.	— — —	84	<i>Constella- tions in the North Hemi- sphere.</i>
14	TRIANGULUM.	— — —	24	
15	PERSEUS.	— — —	67	
16	AURIGA.	— — —	68	
17	COMA-BERENICES.	— — —	40	
18	BOOTES.	— — —	55	
19	CORONA-BOREALIS.	— — —	21	
20	SERPENTARIUS.	— — —	59	
21	SERPENS.	— — —	69	
22	AQUILA & ANTINOUS.	— — —	70	
23	SAGITTA.	— — —	23	
24	DELPHINUS.	— — —	18	
25	EQUULUS.	— — —	10	
26	PEGASUS.	— — —	93	
27	CASSIOPEA.	— — —	56	
28	URSA-MAJOR.	— — —	215	
29	ALCIDES.	— — —	95	
30	LYRA.	— — —	19	
31	CYGNUS.	— — —	107	
32	CEPHEUS.	— — —	35	
33	URSA MINOR.	— — —	14	
34	DRACO.	— — —	49	
35	CETUS.	— — —	78	
36	EURIDANUS.	— — —	68	
37	ORION.	— — —	80	
38	LEPUS.	— — —	19	<i>Constella- tions in the South Hemi- sphere.</i>
39	CANIS-MAJOR.	— — —	32	
40	CANIS-MINOR.	— — —	17	
41	ARGO-NAVIS.	— — —	25	
42	HYDRA.	— — —	68	
43	CRATER.	— — —	11	
44	CORVUS.	— — —	10	
45	LUPUS & CENTAURUS.	— — —	13	
46	PISCIS-AUST.	— — —	16	

IN all properly 49 Constellations containg 2677 Stars, which are rectified by the late Mr. *Flamsteed* to the beginning of the Year 1690.

THERE are also several other Constellations drawn upon the *Celestial Globe*, which are seen only to the *Southern Hemisphere*, and are not therefore mentioned by Mr. *Flamsteed* as not having an Opportunity to observe them. These were first form'd into Constellations by the *Arabians*, &c. and have since been improv'd by Dr. *Halley's* Observations at the *Island of St. Helena*, being in Number 15, which together with the Former, compleat the Catalogue of the Antients, as delivered down to us by *Ptolomy* and *Tycho Brahe*; their Names are as follow, viz.

	N ^o . of Stars.		
1 PHÆNIX.	—	—	13
2 GRUS.	—	—	14
3 INDEX.	—	—	12
4 PAVO.	—	—	14
5 APUS.	—	—	11
6 TRIANGULUM.	—	—	5
7 MUSCA.	—	—	4
8 ROBUR-CAROLI.	—	—	13
9 TAUCAN.	—	—	9
10 CHAMELION.	—	—	10
11 HYDRUS.	—	—	7
12 PISCIS-VOLANS.	—	—	10
13 COLUMBA-NOACHI.	—	—	9
14 ARA.	—	—	9
15 XIPHIAS.	—	—	7

ALL

ALL these lie within the Distance of 50 Degrees from the *South Pole*, and consequently are below our Horizon and to us invisible.

HEVELIUS likewise and others have form'd new Constellations out of such Stars as lay betwixt the old Ones, such are the

	N ^o . of Stars.
1 LACERTA, or STELLIO. --	12
2 RAMUS & CERBERUS. --	9
3 CHARA. ——— ———	11
4 ASTERION. ——— ———	13
5 COR-CAROLI. — ———	3
6 LEO-MINOR. — ———	20
7 LYNX. ——— ———	55
8 CAMELOPARDULUS. ———	24
9 MUSCA. ——— ———	6
10 TRIANGULUM-MINOR. ---	5
11 VULPECULA. — ———	29
12 ANSER. ——— ———	10
13 SCUTUM SOBIESCI. ———	8
14 MONS MÆNALUS. ———	11
15 MONOCEROS. — ———	32
16 SEXTANS URANIÆ. ———	4
17 CRUSERO. ——— ———	4

MAKING in all as they are now drawn on the *Celestial Globe* 81 Constellations. To which may be added, for the better Regulation of those Stars that are yet unformed, *viz.*

	N ^o . of Stars.
1 Arca Noë ; near Lepus's Head. — —	5
2 Oculus	

2	Oculus Uraniaë ; above Mons Menalus.	—	1
3	Paradisus, before Cætus's Neck.	— —	11
4	Sceptrum Britannicum ; between Peg. & Dolph.		4
5	Turris Babelonica ; below Spica Virginis.		12
6	Orbis Regius ; between Libra & Scorpio.		10
7	Pfittacus ; between Leo hind Foot & Sextans.		2
8	Sciurus ; near the Last.	— — —	7

THE whole making 2852 Stars, and are all laid down very accurately upon Mr. *Senex's Globe*.

Now for the better distinguishing the Places of these Stars as well as the Motion of the heavenly Bodies ; Astronomers conceive several Circles to be described within the Sphere of the Heavens ; several of which are really delineated upon the *Celestial Globe*, and have been already defin'd under the Use of the *Terrestrial Globe*, viz. the *Horizon*, *Meridian*, *Equator*, (or rather *Equinoctial*, when we speak of the Heavens) the *Ecliptic*, the two *Tropics* and the *Polar Circles*. These I say are common to both Globes as well as the 12 Points, to which may be added, viz.

THE POLES of the ECLIPTIC which are always mark'd on the Celestial Globe, and fall in the Arctic and Antarctic Circles at 23° 29' distance from the Poles of the Equinoctial.

THE Circles which are peculiar to the Celestial Globe are either Real or Imaginary.

The Real are, viz.	{	1. THE ZODIAC.		Ima- ginary are viz.	{	1. Azimuth Circles.
		2. THE 2 COLURES.				2. Almucantars. Or
		3. CIR. of LONGITUDE.				Parallels of Altitude.
		4. PAR. of LATITUDE.				

(2.) THE

(2.) THE ZODIAC is a broad Circle whose Middle is the Ecliptic, and it's Extremes, two Circles parallel thereto, at such a Distance from it as to bind or comprehend the Excursions of the Moon or Planets.

THE Sun never deviates from the Middle of the Zodiac, *i. e.* the Ecliptic, but the Planets all do, either more or less.

USE. THE Breadth of the Zodiac serves to measure the greatest Deviations call'd the Latitude of the Planets; and is broader or narrower as the greatest Latitude of the Planets is made more or less. Some make it 16, some 18 and some 20 Degrees Broad.

(3.) THE COLURES are also two great Circles of the Globe, and quarter it, or cut it into Four equal Parts, intersecting each other in the Poles of the Equinoctial.

ONE is call'd the Solstitial Colure and cuts the Ecliptic in the 1st Degree of φ and ψ : The other is called the Equinoctial Colure and intersects the Ecliptic in γ and α .

USE. THESE Circles serve to distinguish the Seasons; for when the Sun in it's apparent annual Course passes under the Equinoctial Colure, then commences the Spring and Autumn. But when he passes under the Solstitial Colure, the Winter and Summer begin respectively.

(4.) CIRCLES of LONGITUDE are those great Circles which cut the Ecliptic at right Angles, and interest one another in its Poles; they are generally drawn thro' every

15 Degrees of the Ecliptic ; besides which we may imagine as many Circles of Longitude as there are Points, or Degrees and Minutes in the Ecliptic.

USE. By help of these Circles the Longitude of any Point in the Heavens ; as a Star, Planet, &c. may be found, which is an Arc of the Ecliptic contain'd between the Circle of Longitude passing through that Point and the Equinoctial Point γ .

(5.) CIRCLES OF LATITUDE are those lesser Circles which are drawn parallel to the Ecliptic still diminishing in proportion as they recede from it.

USE. By help of these Circles the Latitude of any Point in the Heavens as a Star or Planets may be easily found ; which is nothing else but the Star or Planet's nearest Distance in Degrees from the Ecliptic, and is either North or South.

THE Sun has no Latitude, being always in the Ecliptic ; nor do we usually say or speak of his Longitude, but rather his Place in the Ecliptic as before mention'd ; and be it further observ'd, that Longitude and Latitude on the Celestial Globe bears just the same Relation to the Ecliptic, as they do on the Terrestrial Globe to the Equator.

THUS, as the Longitude of Places on the Earth is measur'd by Degrees on the Equator, counting from the First Meridian ; so the Longitude of heavenly Bodies is measur'd by Degrees on the Ecliptic, counting from the First Circle or Line of Longitude, viz. that which passes thro' the

the First Point of γ . And as Latitude on the Earth is measur'd by Degrees upon the Meridian counting from the Equator; so Latitude of the heavenly Bodies is measur'd by Degrees upon a Circle of Longitude, counting either North or South from the Ecliptic.

(6.) AZIMUTH CIRCLES, called also VERTICAL CIRCLES, are imaginary great Circles intersecting each other in the Zenith and Nadir, and cutting the Horizon at right Angles in all the Points thereof, and on the Globe are represented by the Quadrant of Altitude when skrew'd in the Zenith.

THE AZIMUTH therefore of the Sun or Star is an Arc of the Horizon comprehended between the Meridian of the Place and any given Vertical.

THE Horizon being divided 360° for this Reason they usually conceive 360 Azimuths; of these Azimuth Circles that which passes through the North and South Points of the Horizon is called the Meridian; and that which passes through the East and West Points of the Horizon is call'd the *Prime Vertical*, or *Circle of East and West*.

USE. ON the Azimuth Circles is reckon'd the Altitude, or Height of the Sun or Stars, &c. when they are not in the Meridian; that is, the Azimuths shew what Distance these are at from the Horizon.

(7.) ALMACANTHERS OR PARALLELS OF ALTITUDE are also imaginary lesser Circles of the Sphere and Parallel to the Horizon, and are suppos'd to pass through

H

every

every Degree and Minute of the Meridian in the Heavens, between the **Horizon** and the **Zenith**, having their Poles in the **Zenith**.

ON the **Globe** they are represented by the Divisions on the **Quadrant of Altitude** in it's Motion about the **Body of the Globe**, when skrew'd in the **Zenith** of any **Place**.

ANY celestial Object is said to have no **Altitude** when in the **Horizon**, consequently its greatest **Altitude** is when it is in the **Zenith**, as its greatest **Depression** is he is when in the **Nadir**.

(8.) **DECLINATION** in the Heavens is the same as **Latitude** upon the **Earth**, it being the true Distance of any **Star**, **Planet**, &c. from the **Equinoctial**, **North** or **South**, and is reckon'd upon the universal **Meridian**.

THE **Sun** is said to have no **Declination**, when in the **Equinoctial**, and his greatest **Declination** is when in either of the **Tropics**, viz. $23^{\circ} : 29'$.

(9.) **RIGHT ASCENSION** in the Heavens, or upon the celestial **Globe**, is reckon'd the same as **Longitude** upon the terrestrial **Globe**; it being an **Arc** of the **Equinoctial** contained between the **Beginning of γ** , and that **Point** of the **Equinoctial** which rises with the **Sun** or **Star** in a right **Sphere**, or which comes to the **Meridian** with them in an **Oblique Sphere**.

(10.) **OBLIQUE ASCENSION**, or **DESCENSION**, is an **Arc** of the **Equinoctial** intercepted between the first **Point of γ** and that **Point** of the **Equinoctial** which
rises

rises in the former, or sets in the latter Case with the Sun or Star, &c, in an Oblique Sphere.

THE Oblique Ascension is always number'd from West to East, and is more or less according to the different Obliquity of the Sphere.

(11.) ASCENSIONAL DIFFERENCE, is the Difference betwixt Right and Oblique Ascension. The Sun's ascensional Difference being turn'd into Time, (*i. e.* reckoning 15 Degrees to be an Hour, and 1 Degree to 4 Minutes.) is just so much as he rises before, or sets after 6 o'Clock.

(12.) THE AMPLITUDE at rising or setting of the Sun or Star, is an Arc of the Horizon intercepted between the Point where the Sun or Star riseth or setteth, and the true East or West Point; and this Amplitude is either North or South, according as the Sun or Star at rising or setting is to the North or South of those Points; consequently the Sun can have no Amplitude when he is in the Equinoctial, and the greatest Amplitude is when he is in either of the Tropics.

(13.) WHEN the Sun gets so near a Star, as that the Star is hid in his Beams, it is said to set *Heliacally*; and when after its Conjunction with the Sun it becomes visible again, it is said to rise *Heliacally*.

A STAR that rises or sets in the Morning when the Sun rises, is said to rise or set *Cosmically*.

AND a Star which rises or sets in the Evening when the Sun sets, is said to rise or set *Achronically*.



C H A P. V.

*Containing Variety of PROPOSITIONS to be
explain'd by the CELESTIAL GLOBE.*

S E C T I O N I.

Of the Declination, right Ascension, Longitude and Latitude, Amplitude, Azimuth, &c. of the heavenly Bodies.

Prop. 1. **H**AVING the Sun's Place, or any Star given to find its Declination.

Prop. 2. To find the right Ascension of any Star given; as also to find the Sun's right Ascension at any given Time.

Prop. 3. To find the Longitude and Latitude of any given Star.

	<i>Lon.</i>	<i>Lat.</i>
<i>Thus.</i> {	ALDEBARAN. = $65^{\circ} 54'$ from	Υ $5^{\circ} 31' s.$
	ARCTURUS. = 200° — —	Υ $31^{\circ} 00' n.$

Prop. 4. HAVING the Sun's Place or any given Star, to find its *Eastern* and *Western Amplitude*.

Prop. 5.

Prop. 5. To find the Sun's Azimuth for any Hour of the Day, or a given Star at any Hour of the Night.

Prop. 6. HAVING the Sun's Place or any given Star, to find its Oblique Ascension and Descension.

SECTION II.

Of the Culminating, Rising and Setting of the heavenly Bodies, together with their Altitudes.

Prop. 1. To find the Meridian Altitude of the Sun or any fix'd Star, by a Quadrant fit for that Purpose, as also by the Globe.

Prop. 2. HAVING the Latitude of the Place, the Sun's Place and Hour given, to find what Stars are then rising or setting, what Stars are then on the Meridian, or Culminating, and their Altitude above the Horizon.

Prop. 3. HAVING the Time of Culminating of any Star, to find the Hour of its rising and setting; *et vice versa.*

Prop. 4. HAVING the right Ascension of the Sun, and of any fix'd Star, to find the Time when the Star culminates or comes to the Meridian.

Prop. 5. THE Month and Day being given, as also the Moon's Place in the Zodiac, and her Latitude to find the Hour of her Rising and Setting, as also the Time of her Culminating, or coming to the Meridian of the given Place.

Prop. 6. To explain the Phænomenon of the Harvest and Hunter's Moon.

Prop. 7. To find the Place of any Planet upon the Globe, and by that means to find its Place in the Heavens; also to find what Hour any Planet will rise or set or culminate at any Day in the Year.

Prop. 8. To find the Degree of the Ecliptic which rises or sets with any given Star, and from thence to determine its cosmical and achronical Rising and Setting.

Prop. 9. HAVING the Latitude of the Place, and the Degree of the Ecliptic which rises or sets with the Star given to determine the heliacal Rising and Setting of the Star.

S E C T I O N III.

Contains Variety of Propositions relating towards finding the Hour at any Time by the heavenly Bodies.

Prop. 1. BY Observation of a Star upon the Meridian to find the Hour of the Night.

Prop. 2. HAVING the Sun's Place and Altitude of any known Star, to find thereby the Hour of the Night.

Prop. 3. To determine when a given Star will come to the Meridian at any given Hour of the Night.

Prop. 4. Two known Stars having the same Azimuth,
or

or the same Altitude being given to find the Hour of the Night.

Prop. 5. To determine what Day of the Year any Star given will be upon the Meridian at Twelve o'Clock at Night.

Prop. 6. HAVING the Sun's Altitude at any Time given to find the Hour of the Day.

Prop. 7. HAVING the Sun's right and oblique Ascension, to find the ascensional Difference, and consequently the Sun's Rising and Setting, also the Length of the Day and Night.

S E C T I O N IV.

Contains miscellaneous Propositions relating to the Latitude, Altitude, Hour, Azimuth, &c. of the heavenly Bodies.

Prop. 1. HAVING the Declination, and Meridian Altitude of the Sun, or of any fix'd Star, to find the Latitude of the Place or Height of the Pole above the Horizon.

Prop. 2. Two known Stars, one on the Meridian, and the other in the East or West Part of the Horizon to find the Latitude.

Prop. 3. GIVEN the Altitude of two Stars on the same Azimuth to find the Latitude of the Place.

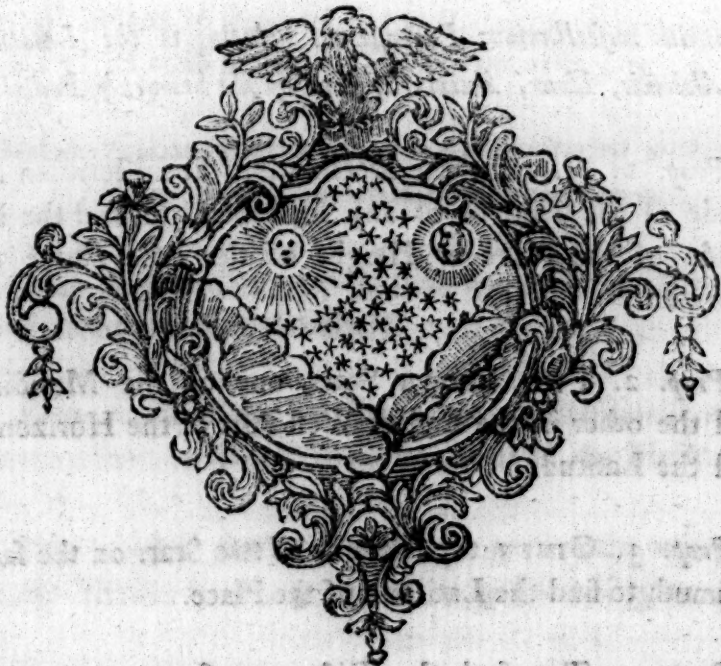
Prop. 4. To find the Distance of any two given Stars.

Prop. 5.

Prop. 5. HAVING the Latitude, Sun's Place, and Hour of the $\left\{ \begin{array}{l} \text{Day} \\ \text{Night} \end{array} \right\}$ to find the $\left\{ \begin{array}{l} \text{Sun's} \\ \text{Star's} \end{array} \right\}$ Altitude and Azimuth.

Prop. 6. THE Latitude, Sun's Place, and Altitude of the $\left\{ \begin{array}{l} \text{Sun} \\ \text{Star} \end{array} \right\}$ being given to find the Hour of the $\left\{ \begin{array}{l} \text{Day} \\ \text{Night} \end{array} \right\}$ and Azimuth.

Prop. 7. THE Latitude, Sun's Place, and Azimuth of the $\left\{ \begin{array}{l} \text{Sun} \\ \text{Star} \end{array} \right\}$ being given to find the Hour of the $\left\{ \begin{array}{l} \text{Day} \\ \text{Night} \end{array} \right\}$ and Altitude.





C H A P. VI.

Of the EQUATION of TIME.

Prop. 1. **T**HE Time from Noon to Noon would not be exactly 24 Hours, but 24 Hours 04 Minutes, if we suppose the Earth to move in the Equinoctial by a constant uniform equal Motion; because in one Revolution the Earth would advance about one Degree further than the Day before.

Prop. 2. AGAIN, if we suppose the Earth to move by an uniform equal Motion along the Ecliptic; yet because of its Obliquity, equal Ares of the Ecliptic will not answer to equal Ares of the Equinoctial.

Prop. 3. THE Earth does not move with a constant uniform equal Motion in the Ecliptic, but sometimes faster and sometimes slower; because it moves in an Ellipse; and in going one half of it, spends Eight Days more in the *Summer* than in the *Winter* half Year; Therefore it unavoidably follows, that the Days are unequal and not exactly 24 Hours.

NOTE. THE Time which is measur'd by a Clock that is supposed to go without Variation and to measure exactly 24 Hours from Noon to Noon is call'd *equal Time*; and *apparent Time* is that which is measur'd by the apparent Motion of the Sun in the Heavens, or by a good Sun Dial.

THE following Table of *Equation of Time* will discover at any Day in the Year how much *Equal Time* is faster or slower than *apparent Time*, and is of great Use in regulating Clocks and Watches.

TABLES

A T A B L E
Of the EQUATION of TIME.

Days.	January.	February.	March.	April.
	H. M. S.	H. M. S.	H. M. S.	H. M. S.
1	12: 4: 14	12: 14: 09	12: 12: 42	12: 03: 57
2	12: 4: 42	12: 14: 16	12: 12: 29	12: 3: 38
3	12: 5: 10	12: 14: 22	12: 12: 16	12: 3: 20
4	12: 5: 37	12: 14: 27	12: 12: 3	12: 3: 2
5	12: 6: 04	12: 14: 32	12: 11: 49	12: 2: 44
6	12: 6: 30	12: 14: 36	12: 11: 35	12: 2: 26
7	12: 6: 56	12: 14: 39	12: 11: 20	12: 2: 9
8	12: 7: 21	12: 14: 41	12: 11: 5	12: 1: 52
9	12: 7: 46	12: 14: 43	12: 10: 50	12: 1: 35
10	12: 8: 11	12: 14: 43	12: 10: 34	12: 1: 18
11	12: 8: 35	12: 14: 43	12: 10: 18	12: 1: 01
12	12: 8: 58	12: 14: 42	12: 10: 1	12: 0: 45
13	12: 9: 20	12: 14: 41	12: 9: 44	12: 0: 29
14	12: 9: 42	12: 14: 38	12: 9: 27	12: 0: 13
15	12: 10: 03	12: 14: 35	12: 9: 10	11: 59: 58
16	12: 10: 24	12: 14: 31	12: 8: 52	11: 59: 43
17	12: 10: 44	12: 14: 27	12: 8: 34	11: 59: 29
18	12: 11: 03	12: 14: 22	12: 8: 16	11: 59: 15
19	12: 11: 21	12: 14: 16	12: 7: 58	11: 59: 1
20	12: 11: 39	12: 14: 09	12: 7: 40	11: 58: 47
21	12: 11: 56	12: 14: 2	12: 7: 22	11: 58: 34
22	12: 12: 12	12: 13: 54	12: 7: 3	11: 58: 22
23	12: 12: 27	12: 13: 45	12: 6: 45	11: 58: 10
24	12: 12: 42	12: 13: 36	12: 6: 26	11: 57: 58
25	12: 12: 56	12: 13: 26	12: 6: 8	11: 57: 47
26	12: 13: 08	12: 13: 16	12: 5: 49	11: 57: 36
27	12: 13: 20	12: 13: 5	12: 5: 30	11: 57: 26
28	12: 13: 32	12: 13: 54	12: 5: 11	11: 57: 16
29	12: 13: 42		12: 4: 53	11: 57: 7
30	12: 13: 52		12: 4: 34	11: 56: 59
31	12: 14: 01		12: 4: 15	

A T A B L E

Of the EQUATION of TIME.

Days.	May.	June.	July.	August.
	H. M. S.	H. M. S.	H. M. S.	H. M. S.
1	11:56:51	11:57:15	12:3:10	12:5:46
2	11:56:43	11:57:24	12:3:21	12:5:42
3	11:56:36	11:57:34	12:3:32	12:5:38
4	11:56:29	11:57:43	12:3:43	12:5:33
5	11:56:24	11:57:53	12:3:54	12:5:28
6	11:56:19	11:58:3	12:4:4	12:5:22
7	11:56:14	11:58:14	12:4:14	12:5:15
8	11:56:10	11:58:25	12:4:24	12:5:8
9	11:56:6	11:58:36	12:4:33	12:5:0
10	11:56:3	11:58:48	12:4:42	12:4:52
11	11:56:1	11:59:0	12:4:50	12:4:43
12	11:55:59	11:59:12	12:4:58	12:4:34
13	11:55:57	11:59:24	12:5:5	12:4:24
14	11:55:56	11:59:36	12:5:12	12:4:13
15	11:55:56	11:59:49	12:5:19	12:4:2
16	11:55:56	12:0:2	12:5:25	12:3:50
17	11:55:57	12:0:14	12:5:30	12:3:38
18	11:55:59	12:0:27	12:5:35	12:3:26
19	11:56:1	12:0:40	12:5:40	12:3:13
20	11:56:3	12:0:53	12:5:44	12:2:59
21	11:56:7	12:1:06	12:5:47	12:2:45
22	11:56:10	12:1:19	12:5:50	12:2:30
23	11:56:14	12:1:32	12:5:52	12:2:15
24	11:56:19	12:1:44	12:5:54	12:2:0
25	11:56:25	12:1:57	12:5:55	12:1:44
26	11:56:31	12:2:09	12:5:55	12:1:28
27	11:56:37	12:2:22	12:5:55	12:1:11
28	11:56:44	12:2:34	12:5:55	12:0:54
29	11:56:51	12:2:46	12:5:54	12:0:37
30	11:56:59	12:2:58	12:5:52	12:0:19
31	11:55:7		12:5:49	12:0:1

A TABLE.

A T A B L E

Of the EQUATION of TIME.

Days.	September.	October.	November.	December.
	H. M. S.	H. M. S.	H. M. S.	H. M. S.
1	11:59:42	11:49:39	11:43:51	11:49:32
2	11:59:24	11:49:20	11:43:51	11:49:55
3	11:59:5	11:49:2	11:43:51	11:50:19
4	11:58:46	11:48:44	11:43:52	11:50:43
5	11:58:26	11:48:26	11:43:54	11:51:8
6	11:58:7	11:48:9	11:43:57	11:51:34
7	11:57:47	11:47:52	11:44:0	11:52:0
8	11:57:27	11:47:36	11:44:5	11:52:26
9	11:57:7	11:47:20	11:44:10	11:52:53
10	11:56:46	11:47:4	11:44:16	11:53:21
11	11:56:26	11:46:49	11:44:23	11:53:48
12	11:56:5	11:46:35	11:44:31	11:54:17
13	11:55:44	11:46:20	11:44:39	11:54:45
14	11:55:24	11:46:7	11:44:48	11:54:14
15	11:55:3	11:45:54	11:44:59	11:55:43
16	11:54:42	11:45:41	11:45:10	11:56:12
17	11:54:21	11:45:29	11:45:22	11:56:42
18	11:54:0	11:45:18	11:45:35	11:57:12
19	11:53:40	11:45:8	11:45:48	11:57:41
20	11:53:19	11:44:57	11:45:56	11:58:11
21	11:52:58	11:44:48	11:46:18	11:58:41
22	11:52:38	11:44:39	11:46:34	11:59:11
23	11:52:17	11:44:31	11:46:51	11:59:41
24	11:51:57	11:44:24	11:47:8	12: :11
25	11:51:36	11:44:17	11:47:27	12: :41
26	11:51:15	11:44:11	11:47:46	12: 1:11
27	11:50:54	11:44:6	11:47:6	12: 1:41
28	11:50:33	11:44:2	11:48:26	12: 2:10
29	11:50:12	11:43:58	11:48:47	12: 2:40
30	11:49:58	11:43:55	11:49:9	12: 3:9
31		11:43:53		12: 3:38

1
2
3
3
4
5
3
1